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Plastic Products

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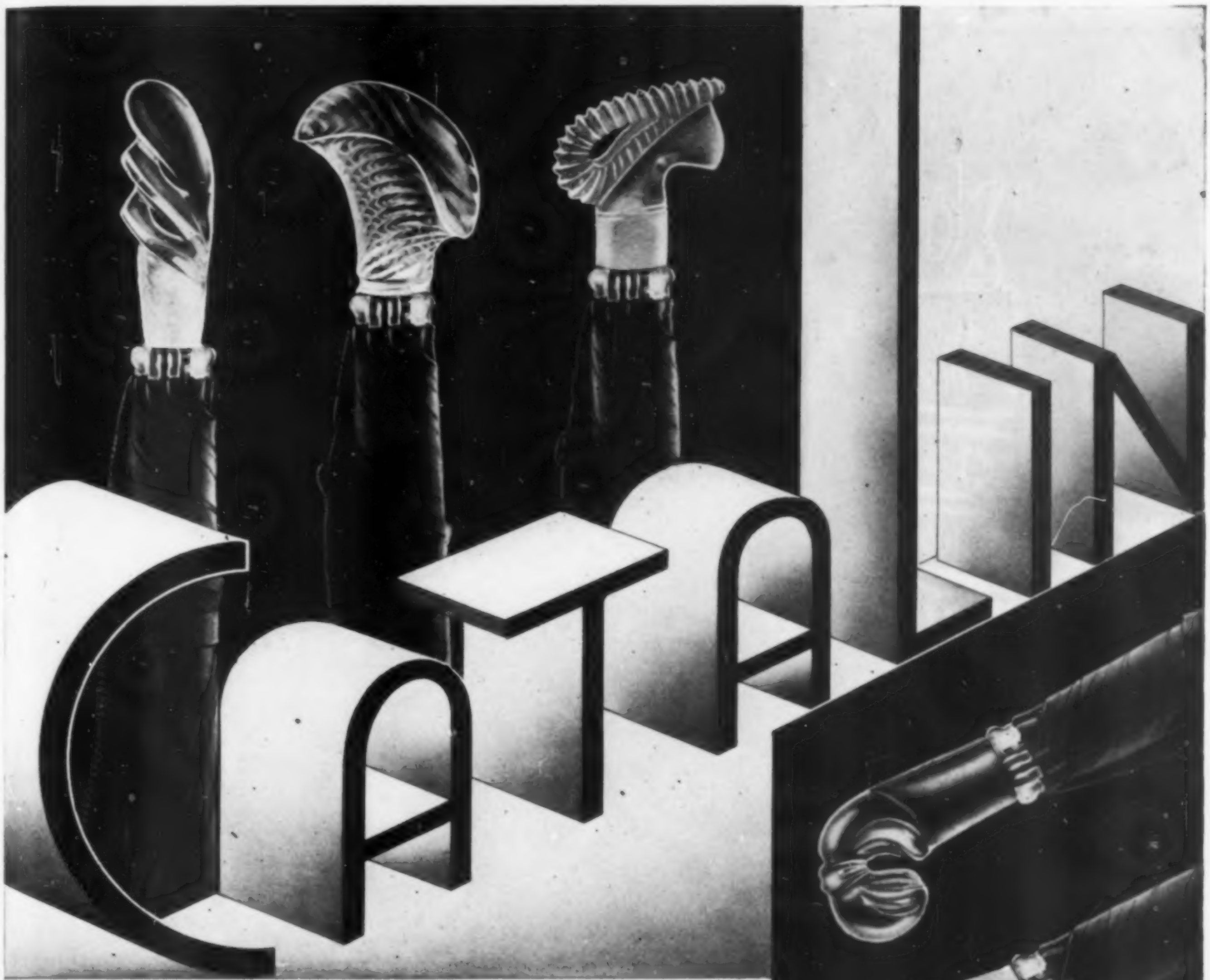

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Plastic Products

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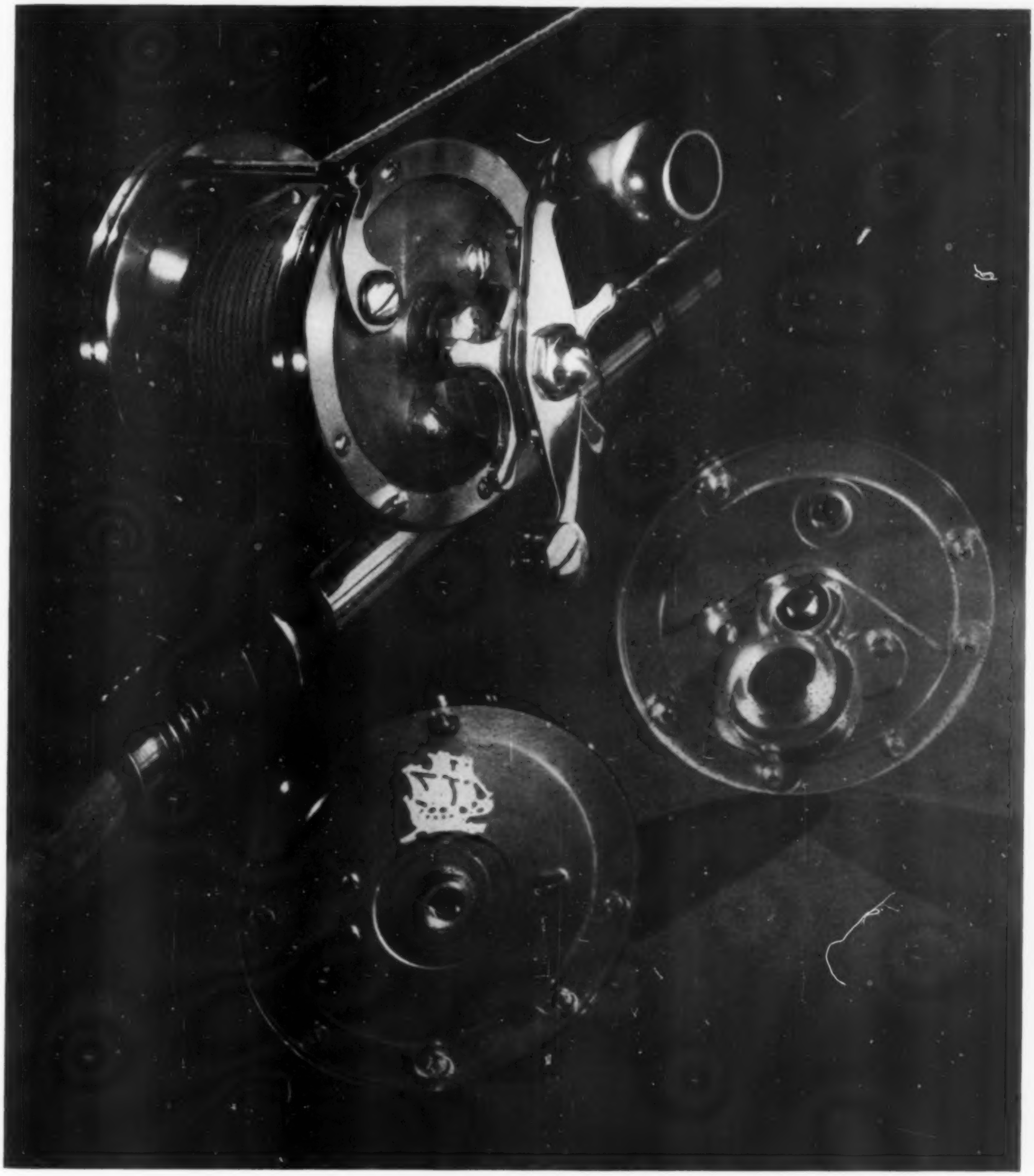
Volume XI **Number 2**

PLASTIC PRODUCTS is published monthly by Plastics Publications, Inc. Williams Haynes, *Chairman of the Board;* R. C. Gilmore, Jr., *President;* Robert C. Gilmore, *Vice-President;* Malcolm H. Frost, *Secretary;* William F. George, *Treasurer.* Published on the first day of each month at E. Stroudsburg, Pa., and printed for the publishers by the Hughes Printing Company. Entered as second class matter at the Post Office at E. Stroudsburg, Pa., under the act of March 3, 1879. Subscription rates: Domestic, two dollars in advance; Canadian, Foreign three dollars a year; single copies current issue, twenty-five cents each, back issues fifty cents each. Notice of three weeks is necessary to change subscriber's address. Kindly give both the old and new addresses. Publication office, East Stroudsburg, Pa. Editorial and Advertising offices, 25 Spruce Street, New York, N. Y.



SINCE October, 1925, this publication — formerly PLASTICS & MOLDED PRODUCTS — has served the plastics industry, keeping step with its development, anticipating and interpreting, wherever possible, its requirements. In this work, it has been the privilege of PLASTIC PRODUCTS to enjoy the friendship and cooperation of the various individuals and organizations who comprise the industry—a fact which has made possible the progress of that publication.

Industrial paper publishing, as with any form of business, is subject to change. That change, as affecting an individual publication or a group of publications, may be made in the direction of its methods of procedure, in policies or in a number of particulars, dictated by the requirements of the industry or industries which are served.

Extended markets for its products, a wider understanding of the possibilities for the use of plastics, are among the outstanding needs of the industry today. With the publication of this issue, the ownership and management of PLASTIC PRODUCTS passes to other hands which we are confident are able to present this picture to those engaged in the industry, as well as those who are actual or potential users of its products, in a manner which conforms to the high standards of present-day industrial journalism.

Breskin & Charlton Publishing Corporation, the new owners, are not entirely unknown to our readers. Through MODERN PACKAGING and the PACKAGING CATALOG this organization enjoys an enviable reputation for outstanding work among industrial publications; its service in the development and acceptance of molded plastics in the packaging field has won deserved recognition.

We have every confidence in the ability and competence of the Breskin & Charlton Publishing Corporation to serve the plastics industry. For this organization we bespeak the cooperation of the plastics industry in all its branches.

R. C. Gilmore, Jr.
President
Plastics Publications, Inc.

Williams Haynes
Chairman of the Board
Plastics Publications, Inc.

THE plastics industry has already given ample evidence of constructive progress. It is now entering upon an era of growth, development and organization which will far surpass its former accomplishments and endeavors.

Its manufacturing technique is quite adequate; its products are ready and only await constructive exploitation. New and wider markets must be created. Present users must be further inspired and potential users educated and transformed into actual buyers. All of this will call for greater attention to the distribution of plastic products than that which has existed heretofore. The considerations involved in the merchandising of such products, therefore, become of prime importance to the industry as well as to those who serve the industry. It is in this direction that the new publication, MODERN PLASTICS, with which is consolidated PLASTIC PRODUCTS, will extend its efforts.

In assuming its responsibility—that of rendering an unprejudiced and impartial service to its readers, MODERN PLASTICS will respect to the utmost those traditions of the plastics industry which have made for constructive development. It will endeavor to express honestly, and fearlessly, such opinions as may be judged beneficial to the unrestricted and sensible growth of the industry, to present practical information regarding the manufacture and distribution of the industry's products and to collate and co-ordinate these efforts in such a way as to be of greatest benefit.

MODERN PLASTICS makes its appearance with the September issue. The format of the new magazine will be surpassingly beautiful. It will be so richly illustrated and so distinguished in appearance that it will be inspiring to turn the pages. And, having turned the pages, the reader will discover editorial content of arresting vitality.

To the fulfillment of this program, the services and resources of our organization are pledged.

Charles A. Breskin
President
Breskin & Charlton Publishing Corp.

Shopping for Plastics on Fifth Avenue

By Dorothy Wilson

FIFTH AVENUE and Fifty-seventh Street, New York, is the national headquarters for our exclusive retail shops, and judged by my experiences in this mecca of specialty stores, plastic products have yet to crash the quality market.

Many of the very best shops do not feature them at all, and even sometimes take pains to pooh-pooh them as cheap and faddish imitations. Where they are stocked the salespeople display an ignorance of what they are and why they are used that quite matches the big general department store, though I found among them an eager interest easily aroused by my questions. Where they are stocked and being intelligently sold they are obviously leaders.

Let's tell the bad news first.

You can go carefully through aisle after aisle at Ovington's, searching their well displayed novelties and gift goods, and find hardly a lone plastic product. I saw a few of them among the toilet sets, none among the desk sets, no plastic smokers' articles, none among the table after table of "bridge prizes." In desperation, up in the glass department I asked for a plastic ice tea set.

"I'm sorry, Madam," replied the quiet spoken, gentlemanly salesman, "but we have nothing in plastic ware—only real glass."

He made me feel just like the "New Yorker" picture of the man who asked for a pack of Camels in Dunhill's, but I managed to explain that I understood they were practically unbreakable and I thought their bright, attractive colors would be nice to use in the garden.

"I'm really sorry," he said, "but we have nothing. You might try one of the department or household furnishing stores," which I rather sensed was just about as close as he dare lower himself to name Kress or Woolworth.

This five-and-ten complex is held quite fixedly in a number of the more exclusive and expensive specialty shops. Todhunter and the Little Gallery and Modern Art are all as bare of plastic wares of any kind as Ovington's, and the most suave and persuasive salespeople will manage with great skill to convey to you the impression that a plastic is a cheap and nasty imitation; something, you know, that no one who really is anybody would for a moment think of having about the house. It is not difficult to follow the commercial instinct of these shops whose reputation is grounded on individuality and who pride themselves on offering distinctive wares not to be found everywhere and whose appeal is never primarily one of price.

On the other hand the finest piece of plastic products salesmanship I encountered in two days was at A. G. Spalding's where I asked my old question: "a picnic-set, please." A beautiful set, fitted throughout completely with two sets of cups (one with and one without handles) plates, pepper and salt shakers, sandwich and salad boxes, all of plastic material with knives, forks, and spoons with plastic handles was shown me by a salesman who, if he did not know too much about what a plastic is, certainly has the right enthusiasm for what a plastic will do.

"What are these cups made of?" I asked as a starter.

"They're made of Beetleware," he answered.

"Why do you make them of that?"

"We've found that it is by long odds the most desirable material. A picnic set is apt to get pretty rough use, and these pieces are not only almost unbreakable, but they do not stain, they are extremely light, and they clean even more easily than enamel ware—quite as easily as china. Moreover, they are not affected by either heat or cold, though, of course, it is wiser to use these cups with handles for hot drinks. Also, I want to call your attention not only to the most attractive green color, but also to how perfectly the exact shade is matched in every one of these pieces, whether it is the plates or the salt-cellar or the knife handles. We have found it so very satisfactory that now it is the only material we use in our better picnic sets. We do have tin sandwich boxes in some of the cheaper sets, but this Beetleware keeps sandwiches cooler and more moist because the top fits on so evenly and closely."

"Just what is Beetleware."

"It's a composition," and seeing I looked puzzled he added, "it's like Bakelite. I'm afraid," he continued laughing, "that's not a very good explanation. I cannot tell you what it is, but it's some new process developed by the du Ponts. They have tested it out thoroughly and it's very satisfactory."

"Is it a chemical process?"

He looked startled—almost shocked—and hesitated: "Well —er—I don't know, but I suppose you might call it some kind of a chemical process."

What An Advertising

To "Plastic Products":

I have just had the pleasure of reading Dorothy Wilson's initial article. I cannot commend you too highly for your constructive effort in trying to educate the technical and business heads of the plastics industry to "life as it actually is on the other side of the tracks."

But I do believe that the sales clerks interviewed exhibited as great a knowledge of plastic materials as sales clerks are likely to have about other materials. Have you ever asked a sales clerk to explain the advantages of aluminum cooking utensils as compared with enamel? Or the difference between Sanforized

There was so much sincerity in his sales talk that I felt he was offering me the very best possible kind of material for a picnic set. No suggestion here of imitation or of cheapness—in fact, so contagious was his enthusiasm that any customer must have been convinced that not to buy a plastic picnic case would be a serious mistake.

In Yardley's window, in Radio City, plastic jars and plastic closures are receiving a wonderful display which naturally enough tempted me in. The very smooth platinum blond who waited on me was surprised that I was more interested in the containers than the famous Yardley cosmetics and positively horrified at the suggestion that I would like to buy the jars without the contents. From her I learned, however, that the jar for the facial cream was made in England of a special composition to imitate ivory and that the black rose-shape screw top on the glass jar was "only Bakelite."

"But it's most attractive," I protested.

"Yes, we use it because they can make such beautiful shapes, and that's Bakelite too," she added, pointing to a lavender screw top on a bottle of toilet water. "It is not as attractive as this carved rose; but it is very practical. It cannot leak and it doesn't stain or break."

No toy shop in the land is so famous as Schwartz, where I asked for a doll's tea set, determined to let nature take its course as to what was offered me. Apparently those pressed lead sets I remember playing with are quite passé, for I was shown painted tin, aluminum with colored handles, china, and "Richelain" which I was assured was Celluloid.

"But isn't that inflammable?" I protested. "I should think that would be very dangerous for children to play with."

"Why so should I," the clerk agreed. "Wait, I must find out"—and she went to the other side of the store to telephone. In a moment she returned with reassuring information. "I was mistaken," she said, evidently relieved, "it isn't Celluloid, it's Richelain!"

"My goodness, what's Richelain"? I asked in mock surprise.

"It's a new composition material which is non-inflammable, tasteless, quite harmless, and unbreakable." She was plainly repeating what some salesman had told her buyer, and I accepted her story.

"Do you sell more of this set than of the others?"

"No, I don't think so. They sell very well, but I don't think they are any more popular than these others."

At Hammacher-Schlemmer I came back to my ice tea glasses—unbreakable ones to use out of doors—and was directed to the bathroom fittings department on the third floor where I was promised I could get tall glasses and coasters too. Here was a remarkably complete line in size from a small tumbler to a tall glass, with straight sides, bell sides, and flaring tops, plain and hand-painted with flowers, conventional and geometric designs and even monograms in colors, all ranging from white and ivory to dull gray and black.

"We do a right smart specialty business in these," said a very pretty and very Southern saleswoman. "You see we make any size or any shape in any of these shades," and she showed me a string of some twenty-four Beetleware color disks. "We have our own artist and we do a great deal of special-to-order work for folks who want to match certain colors and decorative schemes in their bathrooms."

"What are these made of?"

"They call it Beetleware."

"But what's Beetleware?"

"Ah certainly wish Ah knew. It's some kind of a secret process, and they sho' do keep the secret well. Ah've asked three or fo' of the people round heah—Ah've even asked the buyer—and all they'll tell me is it's some sort of a secret composition, an' that sho' don't get anywhar, does it now?"

Producing Infusible Masses

Infusible masses are obtained by submitting fusible condensation products (obtained from primary aromatic amines and formaldehyde in the absence of acid or in the presence of less than ¼ mol. of acid for 1 mol. of amine) to the action of fresh amounts of aldehydes or agents liberating aldehydes at temperatures not above 140°, with or without the use of acid condensing agents, and causing the final hardening at higher temperatures, if necessary under pressure. Fr. Pat. 749,962.

Expert Thinks About Plastic Sales

shrunk and pre-shrunk? Or the difference between one refrigerator and another?

If your experience checks with mine, you'll agree that sales clerks know lamentably little about the whys and wherefores of what they sell. On the whole, I'd say that plastics came off right well as compared with the dearth of information and misinformation available in retail stores about older materials. Of course, if the question is "Should sales clerks and their customers be exposed to a greater knowledge of the utility and beauty of plastics?" there is only one answer. But unfortunately while all manufacturers of plastics seem to agree on the need for education, the second question raises its ugly head, "What'll we use for money"?

Perhaps the whole industry would move forward faster and farther if there was more attention paid to marketing and less emphasis on price. I recently shopped the Grand Central—Times Square district for a "molded camera." I finally found one quite by accident gathering dust on the shelf of a stationery store in the little town of Cedarhurst, Long Island, 20 miles away!

Keep up the good work. A balanced mental diet is good for the best engineers and chemists.

Sincerely, James J. McMahon
Gardner Advertising Co.
New York, July 5, 1934

The Transmission of Water Vapor Through Cellulosic Membranes

by Harold A. Levey

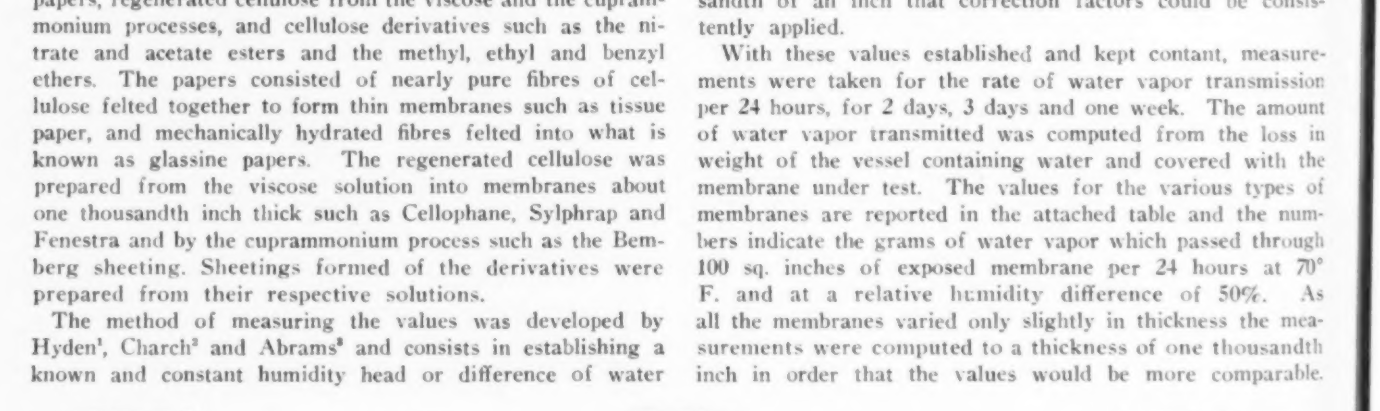
UP TO about a hundred years ago, the only forms of cellulose sheet material known or in use were composed of the cellulose fibres as such. Because of the inertness of this abundant basic material, it has long been the goal of the chemist to discover ways and means to enable it to be more readily worked into desired forms of greater usefulness. It was obvious that this could be most readily accomplished through the use of solvents. However, it has been only within the past few decades that commercially successful results have been achieved by such means.

It is the purpose of this paper to present certain facts and discuss the behavior of thin sheet material made from cellulose and cellulose derivatives with reference to the passage of water vapor through same. The water vapor under consideration is in the form of the humidity of the atmosphere.

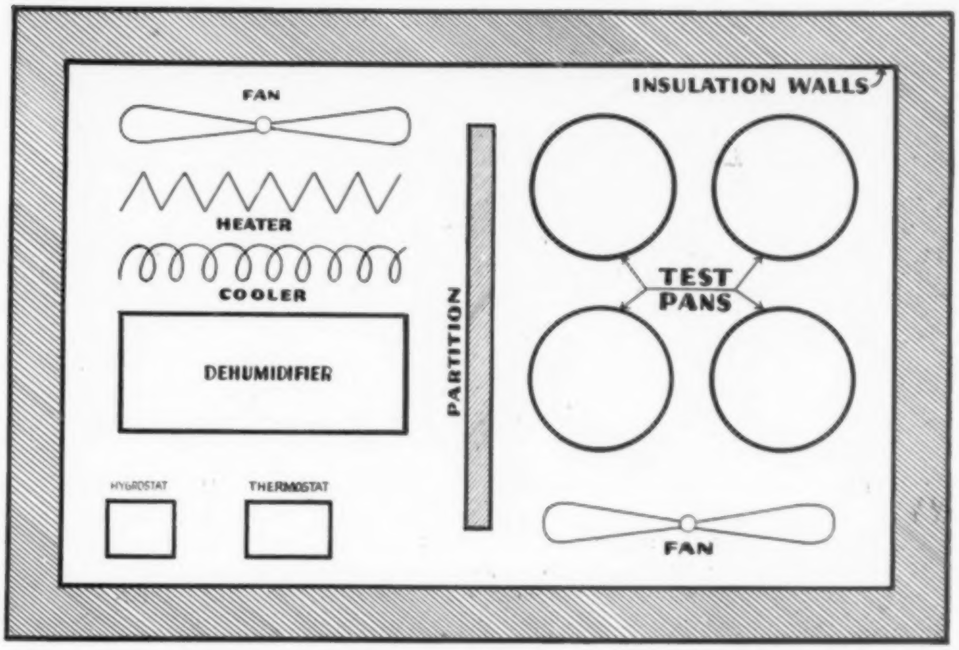
The cellulosic sheeting or membranes studied consist essentially of three types, viz.: felted cellulosic fibres such as papers, regenerated cellulose from the viscose and the cuprammonium processes, and cellulose derivatives such as the nitrate and acetate esters and the methyl, ethyl and benzyl ethers. The papers consisted of nearly pure fibres of cellulose felted together to form thin membranes such as tissue paper, and mechanically hydrated fibres felted into what is known as glassine papers. The regenerated cellulose was prepared from the viscose solution into membranes about one thousandth inch thick such as Cellophane, Sylphrap and Fenestra and by the cuprammonium process such as the Bemberg sheeting. Sheetings formed of the derivatives were prepared from their respective solutions.

The method of measuring the values was developed by Hyden[1], Charch[2] and Abrams[3] and consists in establishing a known and constant humidity head or difference of water vapor concentration on each side of the membrane under test. This condition was obtained by sealing the membrane over a vessel forming a gas-tight joint. This was accomplished as detailed in the drawing. A small amount of water was placed in the vessel prior to closing same with the membrane. Obviously, within a few minutes a condition of 100% humidity at that temperature will prevail within the vessel. The atmosphere will become saturated and no more water will evaporate until either the temperature is raised or some of the water vapor passes through the membrane. This vessel so prepared is then placed in a closed chamber or oven where the humidity and temperature conditions are maintained constant. The relative humidity was maintained at 50% and the temperature at 70° F. A small movement of air over the vessel was maintained constant at 200 linear feet per minute. The top of the vessel exposed an area of the membrane equivalent to 50 sq. inches. Nearly all the membranes tested were of thicknesses so close to one thousandth of an inch that correction factors could be consistently applied.

With these values established and kept contant, measurements were taken for the rate of water vapor transmission per 24 hours, for 2 days, 3 days and one week. The amount of water vapor transmitted was computed from the loss in weight of the vessel containing water and covered with the membrane under test. The values for the various types of membranes are reported in the attached table and the numbers indicate the grams of water vapor which passed through 100 sq. inches of exposed membrane per 24 hours at 70° F. and at a relative humidity difference of 50%. As all the membranes varied only slightly in thickness the measurements were computed to a thickness of one thousandth inch in order that the values would be more comparable.



Sectional Elevation of Circular Test Pan



Constant temperature-humidity test oven. Plan of Section.

It is noted from the table that papers being a felted mass of cellulose fibres are quite porous and transmit considerable amounts of water vapor under these conditions. The less porous papers such as the glassines which are mechanically hydrated, and the vegetable parchments which are chemically hydrated transmit less. The membranes of regenerated cellulose transmit rather large amounts, due in all probability to the hygroscopicity of the glycerol which they contain, and which is added to render these forms of sheeting flexible. The values for the membranes made from the commercially available cellulose derivatives grade down from cellulose acetate which is the highest, to cellulose nitrate which is the lowest. The transmission value on several other materials, which while seemingly true of the value for the membraneless or open pan is equivalent to a blank test.

In many other studies made from these it was noted that the change in the velocity of the air over the pans affected the values for the water vapor tranmission but very slightly, rising but 2½% by increasing the air velocity over the pans from 200 to 600 linear feet per minute.

An increase in temperature causes a very substantial rise in the rate of water vapor transmission approximating about 2½% per degree rise between 70° and 100° F.

It was observed that there was an acceleration in the rate of water vapor transmission up to about 5 hours, after which the rate remained practically constant thereafter.

It was also noted that a straight line curve resulted from changes in the humidity differences diminishing at the rate of a little less than 2½ gms. per degree difference in humidity between 30% and 100%.

From Table 1, we have observed that the water vapor transmission bears a very close relation to the water absorption of these products.

Measurements were made with the vapors of liquids other than water, and except for these organic liquids which are solvents for the cellulose derivatives the rate of vapor transmission was in agreement with the vapor pressure of the organic liquid at that temperature.

As these various forms of sheeting (not the papers) are suitable as dialyzing membranes and usable for osmosis measurements, we noted also that the dialyzing rate bore a reasonably close relationship to the rate of water vapor transmission.

In addition it was also observed that these tabulated values bore the same relationship to the water absorption of these cellulosic products. In this investigation it was evident that the mechanism of this water vapor transmission through these various types of membranes consisted in the vapor being absorbed on the humid side of the sheet, and evaporated from the relatively dry side of the sheet. Between these two surfaces there existed a gradient of water vapor transfer due to the difference of humidity head existing within the body mass of the sheet and resulting from these maintained conditions externally. Aside from the inherent nature of the material itself, the wettability of the surface by water plays a very important role in determining the degree of moisture transmissibility of the sheet. This was evident when only the side of the sheet subjected to the higher humidity was thinly coated with a water repellant substance such as the waxes.

TABLE OF THE TRANSMISSION OF WATER VAPOR THROUGH VARIOUS TYPES OF CELLULOSIC MEMBRANES

Type of Material	*Grams per 24 Hours Computed to a Membrane Thickness of 1/1000 inch*
Tissue Paper	48
Glassine Paper	39
Vegetable Parchment	42
Regenerated Cellulose (Viscose Process)	55
Regenerated Cellulose (Cuprammonium Process)	54
Cellulose Acetate Sheeting	41
Cellulose Nitrate Sheeting	9
Cellulose Methyl Ether Sheeting	28
Cellulose Ethyl Ether Sheeting	25
Cellulose Benzyl Ether Sheeting	12
Aluminum Foil	0.2
Rubber Sheeting	0.5
Open Pan	150
Silk Handkerchief	76

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1. Jour. Ind. & Egn. Chem. Vol. 21, 5, p. 407 (May, 1929).
2. U. S. Patent No. 1,737,187 (Nov. 26, 1929).
3. Paper Trade Journal, Oct. 30, 1930, pp. 1-6.

Petroleum-furfural Resins

In conjunction with another material formerly wasted, in the shape of the unsaturated aliphatic and aromatic hydrocarbons produced during the cracking of petroleum, furfural yields valuable jet black resins of conspicuous electrical insulating value, and which have, therefore, been proposed as ingredients of moulding powders. A moldable resin is obtained by heating 150 volumes furfural with 250 volumes cracked gasoline in presence of 1 per cent. by weight sulfuric acid. After the reaction has proceeded for about twenty minutes, the product is cooled when it takes the form of a jet black jelly.—*From British Plastics.*

Most Economical Size of Mold for A Given Number of Parts

by Alexander L. Alves, M.E.

WITH the rapid development of the plastics industry it is essential for the progressive molder to have some scientific method of determining the proper capacity of a mold for producing a given number of parts. The manufacturer of molded products very often receives inquiries from prospective customers asking for prices on a certain number of parts. It so happens that most of the inquiries state the approximate number of these parts which the customer expects to use during a given period of time. The molder is first faced with the problem of determining the size of mold required. It is safe to assert that most estimators do not approach the problem from a technical and scientific standpoint. The objective of the author is to derive a simple mathematical formula for determining the most economical size of mold for producing a given number of parts.

It must be understood that the most economical size of mold is one that will produce a given number of pieces for the lowest price. It appears, then, that it is even of more importance to the customer to know the size of mold to use than to the molder himself. The molder, of course, is the one who must advise the customer on tool matters and should possess the necessary equipment to approach the problem by some other means besides the trial and error method.

Before going into the actual derivation of the formula we must stop for a moment to analyze the customer's problem. The best illustration is to consider a fictitious example:

Suppose that the estimated number of pieces to be used in, say, a year is 5000, and that the customer expects to write off the books or amortize the tools in one year. If a molder quotes $28.00 per thousand and $200.00 for tools, the actual cost is $68.00 per thousand or $340.00 for the total amount of pieces required, not taking into consideration any interest in the money. What interests the customer now is whether making the mold smaller or larger in size will cut down the total actual cost of the pieces. He is also interested in knowing the exact capacity of mold that will make the piece price a minimum. We shall now solve the problem by the use of maxima and minima using differential calculus.

We all know that size of mold refers to number of cavities in a mold, and it will be shown mathematically that the most economical number of cavities $n = K \sqrt{\frac{N}{P}}\, t$, where

N = number of pieces required in thousand
P = price per cavity in dollars
t = time of cycle in minutes
and K = a constant which is not the same with every molder.

The derivation of the above formula is as follows:

Let S = total actual price per thousand pieces in dollars
N = quantity of pieces required in thousand
L = pressing price in dollars per thousand pieces
l = finishing price in dollars per thousand pieces
M = material cost in dollars per thousand pieces
P = prices in dollars per cavity
X = pressing overhead in percentage of pressing direct labor
y = finishing overhead in percentage of finishing direct labor
Z = administrative overhead and selling expense in percentage of factory cost
R = rate per hour of press man
r = rate per hour of finishing laborer
V = rejects in percentage of labor, overhead and material
p = molders profit in percentage of factory cost plus administrative overhead
n = required number of cavities
F.C = Factory cost

Factory cost = $(M + L + XL + l + yl) + (M + L + XL + l + yl)\,V$

$\frac{60}{t}\,n$ = number of pieces pressed per hour (1)

$$\text{Then, } L = \frac{R}{\frac{60\,n}{t}} \times 1000 = \frac{1000\,Rt}{60\,n}$$

Substituting in equation (1), we have

$$F.C. = \left(M + \frac{100\,Rt}{6\,n} + \frac{100\,Rt}{6\,n}\,x + l + yl\right) + \left(M + \frac{100\,Rt}{6\,n} + \frac{100\,Rt}{6\,n}\,x + l + yl\right) V =$$

$$(1 + V)\left[M + (1 + x)\frac{100\,Rt}{6\,n} + l + yl\right] \qquad (2)$$

Molder's selling price = F.C. + (F.C.) Z + [F.C. + (F.C.) Z] p

Total actual cost S, including tools, per thousand pieces

$$= F.C. + (F.C.)\,Z + [F.C. + (F.C.)\,Z]\,p + \frac{nP}{N}$$

Substituting the values of equation (2) we have

$$S = (1 + V)\left[M + (1 + x)\frac{100\,Rt}{6\,n} + l + yl\right] + (1 + V)\left[M + (1 + x)\frac{100\,Rt}{6\,n} + l + yl\right]$$

$$Z + \left\{ (1 + V) \left[M + (1 + x) \frac{100 \text{ Rt}}{6 n} + 1 + yl \right] + (1 + V) \left[M + (1 + x) \frac{100 \text{ Rt}}{6 n} + 1 + yl \right] Z \right\} p + \frac{nP}{N}$$

Simplifying we get $S = [(1 + V + Z + ZV) (M + l + yl + Mp + lp + ylp)] + (1 + V + Z + ZV) (1 + X + p + Xp) \dfrac{100 \text{ Rt}}{6 n} + \dfrac{nP}{N}$ (3)

The first term of equation (3), the quantity in brackets, may be considered constant for any job in question. By the same reasoning, the coefficient of $\dfrac{100 \text{ Rt}}{6 n}$ is also constant. The reader can readily see why we assume these quantities constant. For instance, the finishing labor per thousand pieces is the same regardless of the number of cavities; the percentage of profit and overhead are also kept constant for long periods of time with any one company. Hence, equation (3) may be written in the form of $S = K_1 + K_2 \dfrac{100 \text{ Rt}}{6 n} + \dfrac{nP}{N}$. Quantities P, t, and N can also be treated as constants because they are usually known or assumed by the estimator before the price S can be determined or the most economical number of cavities n is known.

If we differentiate S with respect to n and equate to zero, we obtain,

$$\frac{ds}{dn} = O - K_2 \frac{100 \text{ Rt}}{6 n^2} + \frac{P}{N} = O; \; n^2 = K_2 \, 100 \text{ Rt} \frac{N}{6P} \text{ or}$$

$$n = \sqrt{K_2 \, 100 \text{ Rt} \frac{N}{6P}} = K \sqrt{\frac{N}{P}\, t} \qquad (4)$$

Equation (4) shows that the number of cavities varies inversely as the square root of the price per cavity and directly as the quantity of pieces required and the time necessary for one complete cycle. K can be readily determined but will have slightly different values for different companies; its value will, however, lie very nearly between 5 and 6. It depends on the pressing overhead, average percentage of rejects, percentage of profits charged, and the piece work rate per hour allowed for the press man.

Let us assume some arbitrary values in order to determine K:

$V = .03$
$Z = .20$
$X = 1.90$
$p = .10$
$R = .50$

Then $K_2 = (1 + .03 + .20 + .03 \times .20) (1 + 1.90 + .10 + .10 \times 1.90) = 3.94284$

$$\text{and } K = \sqrt{\frac{3.94284 \times 100 \times .50}{6}} = 5.73 \text{ approx.}$$

Let us assume now that it is required to find the most economical number of cavities to manufacture ten thousand pieces. A preliminary study of the nature of the piece shows that a mold with about 8 or 10 cavities is worth approximately $20.00 per cavity. The cycle is estimated at about 3 minutes:

Using equation (4) we have

$$n = K\sqrt{\frac{N}{P}\, t} = 5.73\sqrt{\frac{10}{20} \times 3} = 7.013, \text{ or } 7 \text{ cavities}$$

If we were to manufacture these parts from 5, 6, 7, 8, and 9 cavity molds, assuming $2.50 material per thousand $.50/M pieces for finishing, and 125% finishing overhead, the cost to the customer would be as shown by the following table:

	Mfg. cost/M	Tool cost/M	Total cost/M
5 cavity mold	$24.64	$10.00	$34.65
6 cavity mold	21.33	12.00	33.33
7 cavity mold	19.01	14.00	33.01
8 cavity mold	17.24	16.00	33.24
9 cavity mold	15.87	18.00	33.87

Tool cost/M pieces is the term $\dfrac{nP}{N}$, and the values of first column are obtained from equation (3) without the last term. Equation (3) may appear complicated, but the only reason the writer expressed this fictitious estimating system in algebraic form was to get an expression that could be readily handled by means of differential calculus. This equation can be expressed in estimating sheet form as shown below:

Tool cost	$100	$120	$140	$160	$180
Number of cavities	5	6	7	8	9
Material	2.50	2.50	2.50	2.50	2.50
Pressing	5.00	....	....	....	....
Pressing overhead 190%	9.50	....	....	....	....
Finishing	.50	.50	.50	.50	.50
Finishing overhead 125%	.63	.63	.63	.63	.63
Sum	18.13	....	....	....	....
Shop loss 3%	.54	....	....	....	....
Factory cost	18.67	....	....	....	....
Ad. overhead, etc. 20%	3.73	....	....	....	....
Sum	22.40	....	....	....	....
Profit 10%	2.24	....	....	....	....
Total	24.64	....	....	....	....
Selling price	....	....	....	....	....

Equation (3) gives the very same results as shown above. The example for 5 cavities is worked out in detail; the rest show only those quantities that remain constant regardless of the size of mold.

It is evident that the most economical size of mold is one with 7 cavities. Although we know now that the most economical number of cavities n for manufacturing a given number of pieces is given by the equation $n = K\sqrt{\dfrac{N}{P}}\, t$, the estimator must be careful in applying this formula because P and t may vary also. When the piece has a metal insert the cycle for 10 cavities is not the same as for 15 cavities. The price per cavity for a 15 cavity mold may be lower than for a 10 cavity mold. The writer has been using this formula and his method is to first assume a certain number of cavities and then proceed to estimate the price of mold. It might be necessary to use trial values two or three times until satisfactory final results are obtained. If the value of n obtained by the formula is somewhat near the preliminary value assumed the difference will not be enough to affect P or t, and the formula will not have to be used more than once.

Many other factors enter in the final choice of a mold which have not been discussed in this article. Daily production requirements, pressure and space available may be the governing factors in determining the proper capacity of mold. This formula, like many others used by engineers, is only to serve as an auxiliary tool to the estimator. Formulas even though rational, must be used intelligently; they have their field of usefulness, but there are limitations to their practical application.

S = Solvent; SS = Solvent Softener; NSS = Nonsolvent Softener; P = Plasticizer

S = Solidifies or Melts; F = Flash Point

L = Latent Heat of Fusion; S = Specific Heat

Names	Formulae Emperical Structural	Mol Wt	Sp Gr.	D = Diluent	B: Boiling Point	Vapour Pressure	Critical T = Temp. P = Pressure	Viscosity Centipoises	V: Latent Heat of Vaporization	Capillary Constant	Refractive Index	Surface Tension
Methyl Furorate	$C_6H_6O_3$ $C_4H_3OCOOCH_3$	126	1.1786 [12]	S	B 181 [12]						1.4869 [12]	
Methyl Lactate	$C_4H_8O_3$ $CH_3CH(OH)CO_2CH_3$	104 [T]	1.08 [T] 16	S	B 144.8 [T]						1.4156 [T] 16	
Methyl oxybutyrate	$C_5H_{10}O_3$ $(CH_3)_2C(OH)COOCH_3$	118	0.9986 [T] 164	S	B 131 [T]							
di·Methyl Phthalate	$C_{10}H_{10}O_4$ $C_6H_4(COOCH_3)_2$	194 [T]	1.189 [T] 25/25 1.1911 [T] 20.8	SS	F 132 [4] B 282 [T]						1.5159 [10] 1.51546 [T] 20.8	
Methyl Propionate	$C_4H_8O_2$ $CH_3CH_2COOCH_3$	88 [T]	0.917 [T] 8.5/4 0.91662 [T] 18.5	S	S −87.5 [T] F −2 [T] B 79.9 [T]	43.7/20 [16] 66.2/20 [T]	T 257.4 [T] P 39.3 [T]	0.461/20 [T]	S .458/20 [T] 24 V 89		1.3779 [T] 1.37767 [T] 18.5	
di Methyl-phenyl-tolyl urea	$C_{16}H_{18}ON_2$ $(CH_3)_2C_6H_3\cdot NH\cdot CO\cdot NHC_6H_4CH_3$	254		P								
n. Methyl-propyl ketone	$C_5H_{10}O$	86 [T]	0.812 [T] 15/15 0.8089 [T] 20.9	S	S −77.8 [T] B 101.7 [T]			0.473/25 [T]			1.3895 [T] 1.38946 [T] 20.2	25.2/20 [T]
Methyl iso propyl ketone	$C_5H_{10}O$ $CH_3COCH(CH_3)_2$	86 [T]	0.815 [T] 15 0.846 [T] 16	S	S −92 B 93. [T]				S .528/20-91 [T]		1.3862 [T] 1.38758 [T] 16.	
Methyl Sebacate	$C_{12}H_{22}O_4$ $(CH_2)_8(COOCH_3)_2$	230	0.9432 [B] 78°	SS	B 288 (?) [B]							
Methylene chloride	CH_2Cl_2	85 [T]	1.336 [T]	D	S −96.7 [T] B 40.1 [T]	349/20 [B] 348.9/20 [T]		0.4137/25.6 [T]	S .289 20 V 75. 20		1.4237 [T]	26.52/20 [T]
tri Methylene Glycol	$C_3H_8O_2$ $CH_2OH\cdot CH_2CH_2OH$	76 [T]	1.053 [T]	D	B 214d [T]							
di Methyl-ethylene oxide	C_4H_8O	72	0.8344 0	LS	B 56-7 [10]							
α Naphthyl-acetate	$C_{12}H_{10}O_2$ $CH_3COOC_{10}H_7$	186 [T]		P	n 44.8 [T]							
β Naphthyl-acetate	$C_{12}H_{10}O_2$ $CH_3COOC_{10}H_7$	186 [T]		P	n 68.5 [T]							
Nitrobenzol	$C_6H_5O_2N$	123 [T]	1.207 [T] 1.2039 [T]	NSS	S 5.7 [T] F 88 [T] B 210.9 [T]	7.5/80 [T]		2.013/20 [T] 1.682/31 [T]	L 22.5 [T] S .340/30 [T] V 79.2/208 30		1.55291 [T]	43.9/20 [T]
Nitrolinolein				NSS								
Nitro Methane	CH_3O_2N CH_3NO_2	61 [T]	1.139 [T] 1.1354 [T] 21.6	S	S −29.2 [T] B 101.9 [T]	101.9/47 [T]		0.619/25 [T]	S .418/17 [T] V 135/100 [T]		1.382 [T] 1.38133 [T] 21.6	36.33/20 [T]
Nitroricinolein				NSS								
Oenantholdehyde	$C_7H_{14}O$ $CH_3(CH_2)_5CHO$	114 [T]	0.850 [T] 0.8495 [T]	D	S −45 [T] B 155. [T]						1.4131 [T] 1.42571 [T]	
Oleic Acid	$C_{18}H_{34}O_2$ $CH_3(CH_2)_7CH\cdot CH(CH_2)_7COOH$	282 [T]	0.895 [T] 15/4	NSS	S 14. [T] B 286/100 [T]						1.463 [T] 17.7°	32.50/20 [T]
di Oxydiphenyl di methyl methane	$C_{15}H_{16}O_2$ $(CH_3)_2C(C_6H_4OH)_2$	228		P								
Phenetole	$C_8H_{10}O$ $C_6H_5O\cdot CH_2CH_3$	122 [T]	0.965 [T] 0.9698 [T] 13.8	D	S −30.2 [T] B 172. [T]		T 374 [T] P 33.8 [T]	1.1153/25 [T]	S .446/20 [T]		1.507 [T] 1.51026 [T] 13.7	32.74/20 [T]
Phenyl Benzoate	$C_{13}H_{10}O_2$ $C_6H_5COOC_6H_5$	198 [T]	1.235 [T] 31°	P	S 70. [T] B 314. [T]							
di·Phenyl Carbonate	$C_{13}H_{10}O_3$ $CO(OC_6H_5)_2$	214 [T]		P	S 81. [T] B 302. [T]							34.28/101 [T]

Conclusion of "Series on Solvents and Plasticizers" from July issue

S=Solvent; SS=Solvent Softener; NSS=Nonsolvent Softener; P=Plasticizer

S=Solidifies or Melts; F=Flash Point

L=Latent Heat of Fusion; S=Specific Heat

Names	Formulae Emperical Structural	Mol. Wt.	Sp. Gr.	D=Diluent	B=Boiling Point	Vapour Pressure	Critical T=Temp. P=Pressure	Viscosity Centi-poises	V=Latent Heat of Vaporisation	Capillary Constant	Refractive Index	Surface Tension
di-Phenyl Ether	$C_{12}H_{10}O$ $(C_6H_5)_2O$	170	1.0728 [B]	NSS	S 27 [B] B 246 [B]			3.864/25 [T]				
α Phenylethyl-Alcohol	$C_8H_{10}O$ $C_6H_5CH{\cdot}OH{\cdot}CH_3$	122	1.013 0 [B]	LS	B 202-4 [B]							
β Phenyl ethyl Alcohol	$C_8H_{10}O$ $C_6H_5CH_2CH_2OH$	122	1.0345 0 [S]	LS	B 219. [B]			7.61/25 [T]			1.5267 18° [B]	
Phenyl-methyl Ether	C_7H_8O $CH_3{\cdot}O{\cdot}C_6H_5$	[T] 108	0.994 [T] 0.9989 16.5 [T]	D	S -37.3 [T] B 155.8 [T]			1.01/25 [T]	S .483/20-152 [T] V 81.5/153 [T]		1.517 [T] 1.51950 16.5 [T]	35.22/20 [T]
di-Phenyl Phthalate	$C_{20}H_{14}O_4$ $C_6H_4(COOC_6H_5)_2$	318		P	S 70 [B] B 250-7/14 [B]							
di-hydroxy di-Phenyl Sulfone	$C_{12}H_{10}O_4S$ $(HO{\cdot}C_6H_4)_2SO_2$	250		P	S 179 [B]							
Phenyl-p-toluolsulfonate	$C_{13}H_{12}O_3S$ $CH_3C_6H_4SO_3C_6H_5$	248		P	S 95 [B]							
o-Phthalic Acid	$C_8H_6O_4$ $C_6H_4(COOH)_2$	[T] 166	1.593 [T]	P	M 19. [T]							
o-Phthalic Anhydride	$C_8H_4O_3$ $C_6H_4(CO)_2O$	[T] 148	1.527 4 [T]	P	M 130.8 [T] B 284.5 [T]							
butyl-hydro Phthlate "Hydropalat B"	$C_{16}H_{22}O_5$ $C_6H_3OH(COOC_4H_9)_2$	294	1.005 15 [27]	SS	F 152 [27] B 185-90/10 [27]						1.4638 [27]	
ethyl-hydro Phthlate "Hydropalat A"	$C_{12}H_{14}O_5$ $C_6H_3OH(COOC_2H_5)_2$	238	1.0955 [27]	SS	F 131 [27] B 160-5/10 [27]						1.4820 [27]	
Phthalide	$C_8H_6O_2$ $C_6H_4COCH_2O$	[T] 134	1.1636 99.1 [T]	P	S 65; 73 [T] B 290. [T]						1.53560 99.1 [T]	
Phthalonic Acid	$C_9H_6O_5$ $C_6H_4CO(COOH)_2$	194		P								
d-Pinene	$C_{10}H_{16}$	136	0.8542 25 [B]	D	S -50 [B] B 155 [B]						1.4656 [B]	27.2/12.6 [T] 19.8/91.4
l-Pinene	$C_{10}H_{16}$	136	0.8587 [B]	D	S -55 [B] B 156 [B]						1.4648 25° [B]	27.3/11.4 [T] 19.6/93.8
dl-Pinene	$C_{10}H_{16}$	136	0.858 [B]	D	B 155-6 [B]						1.4655 21° [B]	27.0/10 [T] 19.5/90
Pine Oil (commercial)			0.930-.40 15/5 [23]	D	B 202-20 [23]						1.479 [23]	
Propionic Acid	$C_3H_6O_2$ CH_3CH_2COOH	[T] 74	0.992 [T] 0.98706 19.9 [T]	S	S -22. [T] B 141.1 [T]	456/25 [T]	T 339.5 [T] P 53.0 [T]	1.035/25 [T]	S .560/20-137 [T] V 98.9/139 [T]		1.3868 [T] 1.38736 19.9 [T]	
n-Propyl Acetate	$C_5H_{10}O_2$ $CH_3COO{\cdot}CH_2{\cdot}CH_2CH_3$	[T] 102	0.887 [T] 0.8865 [T]	S	S -92.5 [T] F 12 [4] B 101.6 [T]	61.1/20 [14] 25/20 [T]	T 276.2 [T] P 32.9 [T]	0.557/25 [T]	S .458/20 [T] V 80.45 [J]		1.38438 [T]	24.3/20 [T]
iso Propyl Acetate	$C_5H_{10}O_2$ $CH_3COOCH(CH_3)_2$	[T] 102	0.877 15° [T]	S	S -73. [T] F 4. [9] B 89. [T]			0.5247/20 [T]	V 85. [9]		1.3775 [T]	
n Propyl-acetoacetate	$C_7H_{12}O_3$ $CH_3COCH_2COOCH_2CH_2CH_3$	144		S								
iso Propyl-aceto-acetate	$C_7H_{12}O_3$ $CH_3COCH_2COO{\cdot}CH(CH_3)_2$	144	1.0010 12.8 [T]	S	B 185-7 [B]						1.42066 17.8 [T]	
di-iso Propyladipate	$C_{12}H_{22}O_4$ $(CH_2)_4[COOCH(CH_3)_2]_2$	230	0.977 [9]	SS	B 257/248 [9]							
n Propyl Alcohol	C_3H_8O $CH_3CH_2{\cdot}CH_2OH$	[T] 60	0.8044 [T]	LS	S -127. [T] F 22 [4] B 97.8	15.8/20 [14] 14.5/20 [T]	T 263.7 [T] P 49.9 [T]	1.91/25 [T]	S .66 [8] V 166.3 [J]		1.386 [T] 1.38543 [T]	24.23 [14]

S: Solvent, SS: Solvent Softener, NSS: Nonsolvent Softener, P: Plasticizer — S: Solidifies or Melts, F: Flash Point — L: Latent Heat of Fusion, S: Specific Heat

Names	Formulae Emperical Structural	Mol Wt	Sp Gr.	D: Diluent	B: Boiling Point	Vapour Pressure	Critical T: Temp. P: Pressure	Viscosity Centipoises	V: Latent Heat of Vaporization	Capillary Constant	Refractive Index	Surface Tension
iso Propyl Alcohol	C_3H_8O $CH_3CHOHCH_3$	60 [T]	0.786 [T] 0.7887 [T]	LS	S -85.8 [B] F 19. [6] B 82.3 [T]	35/20 [6]	T 235 [T] P 53. [T]	1.95/25 [T]	L 21 [T] V 161.1 [3]		1.37757 [T]	
n Propyl Benzoate	$C_{10}H_{12}O_2$ $C_6H_5COO(CH_2)_2CH_3$	164 [T]	1.0276 [B] 15/15	SS	S -51.6 [T] B 231.2 [T]				S .397/20 [T]		1.50139 [10] 15	
iso Propyl Benzoate	$C_{10}H_{12}O_2$ $C_6H_5COOCH(CH_3)_2$	164 [T]	1.0172 [B] 15/15	SS	B 218.5 [B]							
n Propyl Benzol	C_9H_{12} $CH_3(CH_2)_2C_6H_5$	120 [T]	0.862 [T]	D	S -101.6 [T] F 30. [29] B 157.5 [T]			0.793/25 [T]	S .400/0 [T] V 72.0/157 [T]		1.4290 [T]	
iso Propyl Benzol	C_9H_{12} $C_6H_5CH(CH_3)_2$	120 [T]	0.864 [T] 0.8681 [T] 12.25		F 52 [29] B 153.4	11.8/20 [T]					1.4930 [T] 1.49549 [T] 12.25	
n Propyl Butyrate	$C_7H_{14}O_2$ $CH_3(CH_2)_2COO(CH_2)_2CH_3$	130 [T]	0.8789 [B] 15	S	S -95.2 [T] B 142.7 [B]	101.2/20 [16]	T 327 [T]	0.8296/20 [T]	S .458/20 [T] V 68.29 [3]		1.4005 [T]	13.2/143 [T]
n Propyl Carbamate	$C_4H_9O_2N$ $NH_2COO(CH_2)_2CH_3$	103 [T]		P	S 53 [B] B 194-6 [B]							
iso Propyl Carbamate	$C_4H_9O_2N$ $NH_2COOCH(CH_3)_2$	103 [T]		P	B 75. [B]							
n. Propyl Carbanilate	$C_{10}H_{13}O_2N$ $C_6H_5NHCOOCH_2CH_3$	179		P	S 57-9 [B]							
iso- Propyl Carbanilate	$C_{10}H_{13}O_2N$ $C_6H_5NHCOOCH(CH_3)_2$	179		P	S 42-3 [B]							
n- Propyl Carbonate	$C_7H_{14}O_3$ $CO(OCH_2CH_2CH_3)_2$	146 [T]	0.968 [T] 22	S	S B 168.2 [T]						1.401 [4]	
iso- Propyl Carbonate	$C_7H_{14}O_3$ $CO[OCH(CH_3)_2]_2$	146 [T]	0.921 [4]	S	B. 147.2 [4]						1.393 [4]	
n Propyl chloracetate	$C_5H_9O_2Cl$ $CH_2ClCO_2(CH_2)_2CH_3$	136	1.1096 [B] 8°	S	B 161. [B]							
iso-Propyl Chloracetate	$C_5H_9O_2Cl$ $CH_2Cl·COOCH(CH_3)_2$	136	1.0944 [B] 15/4	S	B 149 [B]							
n. Propyl Citrate	$C_{15}H_{26}O_7$ $OHC(CH_2)_2(COOCH_2CH_2CH_3)_3$	318		SS	B 198/13 [B]							
iso- Propyl Citrate	$C_{15}H_{26}O_7$ $OHC(CH_2)_2[COOCH(CH_3)_2]_3$	318										
n- Propyl Ether	$C_6H_{14}O$ $(CH_3CH_2CH_2)_2O$	102 [T]	0.747 [T]	LS	S -122. [T] B 89 [T]	64.4/25 [T]					1.3807 [T]	
iso- Propyl Ether	$C_6H_{14}O$ $(CH_3)_2CHOCH(CH_3)_2$	102 [T]	0.735 [T] 16.2	LS	S -60 [19] F <0 [6] B 68.7 [T]	158/20 [6]						
n Propyl Formate	$C_4H_8O_2$ $HCO_2(CH_2)_2CH_3$	88 [T]	0.901 [T]	S	S -92.9 [T] F -3 [T] B 81.3 [T]	45/20 [6] 63.9/20 [T]		0.5134/20 [T]	S .458/20 [T] V 90.36 [3]		1.3779 [T]	24.45 [11]
iso- Propyl Formate	$C_4H_8O_2$ $HCOOCH(CH_3)_2$	88 [T]	0.8826 [B] 0	S	F -5.5 [T] B 68-71/751 [B]			0.5649/20 [T]				
n Propyl Furoate	$C_8H_{10}O_3$ $C_4H_3OCOOC_3H_7$	154	1.0745 [12]	S	B 211. [12]		T 264.8 [T] P 40.1 [T]		V 88.2/20 [T]		1.4750 [12]	
iso Propyl Furoate	$C_8H_{10}O_3$ $C_4H_3OCOOC_3H_7$	154		S								
di-n- Propyl Ketone	$C_7H_{14}O$ $[CH_3(CH_2)_2]_2CO$	114 [T]	0.821 [T] 15/4 0.8160 [T] 21.7	S	S -32.6 [T] B 143.5 [T]			0.685/25 [T]	S .552/20-140 [T] V 75.6/143 [T]		1.4082 [T] 1.40732 [T] 21.7	20.69/10 [T] 24.71/30
n- Propyl Lactate	$C_6H_{12}O_3$ $CH_3CHOHCOOCH_2CH_2CH_3$	132		S								

Names	Formulae Emperical Structural	Mol. Wt	Sp. Gr.	D = Diluent (S = Solvent, SS = Solvent Softener, NSS = Nonsolvent Softener, P = Plasticizer)	B = Boiling Point (S = Solidifies or Melts, F = Flash Point)	Vapour Pressure	Critical T = Temp. P = Pressure	Viscosity Centipoises	V = Latent Heat of Vaporization (L = Latent Heat of Fusion, S = Specific Heat)	Capillary Constant	Refractive Index	Surface Tension
iso-Propyl Lactate	$C_6H_{12}O_3$ $CH_3CHOH \cdot COOCH(CH_3)_2$	132		S								
n-Propyl Phthalate	$C_{14}H_{18}O_4$ $C_6H_4(COOCH_2CH_2CH_3)_2$	250		SS								
iso-Propyl Phthalate	$C_{14}H_{18}O_4$ $C_6H_4[COOCH(CH_3)_2]_2$	250		SS								
n-Propyl Propionate	$C_6H_{12}O_2$ $CH_3CH_2COOCH_2CH_2CH_3$	116 [T]	0.883 [T]	S	S −75.9 [T] F 40 [9] B 123.4 [T]	82/20 [16] 40.8/45 [T]	T 305 [T]	0.6722/20 [T]	S .458/20 [T] V 73.79 [3]		1.3935 [T]	14.3/121.7 [T]
iso Propyl Propionate	$C_6H_{12}O_2$ $CH_3CH_2COOCH(CH_3)_2$	116 [T]	0.8930 0° [B]	S	B 111.3 [T]							
Propyl Stearate	$C_{21}H_{42}O_2$ $C_{17}H_{35}COOCH_2CH_2CH_3$	326		NSS	S 27 [B]							
d-Propylene Diamine	$C_3H_{10}N_2$ $CH_3CHNH_2CH_2NH_2$	74	0.8584 25/4 [B]	D	B 120.5 [B]							
l-Propylenediamine	$C_3H_{10}N_2$ $CH_3CHNH_2CH_2NH_2$	74 [T]	0.8588 [B]	D	B 120.5 [B]							
Propylenediamine (inactive)	$C_3H_{10}N_2$ $CH_3CHNH_2CH_2NH_2$	74 [T]	0.878 [T]	D	B 119. [T]							
Propylene dichloride	$C_3H_6Cl_2$ $CH_3CHClCH_2Cl$	113 [T]	1.166 14 [T]	D	B 96.8 [T]			0.873/25 [T]				
1·2 Propylene Glycol	$C_3H_8O_2$ $CH_3CHOHCH_2OH$	76 [T]	1.038 23 [T]	LS	B 189. [T]							
Propylene Oxide	C_3H_6O CH_3CHCH_2O	58	0.86 15 [6]	LS	B 35. [6]							
Pyridine	C_5H_5N	79 [T]	0.982 [T] 0.9808 21 [T]	S	S −42. [T] B 115. [T]		T 344 [T] P 600 [T]	0.88/25 [T]	S .408/20 [T] V 107/114 [T]		1.50910 21 [T]	38.0/20 [T]
α Terpineol	$C_{10}H_{18}O$ $CH_3C(CH_2)_2CHCH_2CHCOH(CH_3)_2$	154	0.938 15 [B]	D	S 38-40 [B] B 219-21 [B]				V 63.5/183 [30]		1.476 16 [B]	
Terpineol (commercial)	$C_{10}H_{18}O$	154	0.939 –0.942 [23]	D	S 27-32 [23] B 218-21 [23]							
Tetralin 1·2·3·4	$C_{10}H_{12}$	132 [T]	0.971 [T] 0.9729 20.2 [T]	NSS	S F 78. [T] B 207.2 [T]	26.3/100 [T]		2.00*/25 [T]	S .403/15-18 [T]		1.5451 [T] 1.54614 20.2 [T]	
Tetralin 5·6·7·8	$C_{10}H_{12}$	132 [T]	0.975 [T]	NSS	S 30. [T] B 207. [T]			2.00*/25 [T]			1.4804 [T]	
Tetralin Acetate	$C_{12}H_{14}O_2$ $CH_3COOC_{10}H_{11}$	190		SS	B 169/24 [B]							
Thymol	$C_{10}H_{14}O$ $(CH_3)_2CH \cdot C_6H_3OH \cdot CH_3$	150 [T]	0.969 [T] 0.9689 24.4 [T]	P	S 51.5 [T] B 231.8 [T]		T 425 [T]		L 27.5 [T] S .562/50 [T]		1.52269 [B] 1.51893 24.4 [T]	34.2/0 [T] 25.3/115
Toluol	C_7H_8 $C_6H_5CH_3$	92 [T]	0.866 [T]	D	S −95.1 [T] F 6.5 [T] B 110.5 [T]	36.7/30 [T]	T 320.6 [T] P 41.6 [T]	0.5520/25 [T]	S .420/50 [T] V 86.5/110 [T]		1.4962 [T]	28.43/20 [T]
pToluolsulfanolid	$C_{13}H_{13}O_2NS$ $C_6H_5NHSO_2C_6H_4CH_3$	247 [T]		P	S 103. [T]							
o·Tricresyl Phosphate	$C_{21}H_{21}O_4P$ $PO(OC_6H_4CH_3)_3$	368	1.185-9 [2]	SS	S 18 [4] F 215 [4] B 340. [10]						1.498 25°	
Tri-α Naphthyl Phosphate	$C_{30}H_{21}O_4P$ $PO(OC_{10}H_7)_3$	476		P	S 145 [B]							
Tri-β Naphthyl Phosphate	$C_{30}H_{21}O_4P$	476		P	S 111 [B] F 220. [29]							

S = Solvent, SS = Solvent Softener, NSS = Nonsolvent Softener, P = Plasticizer

S = Solidifies or Melts, F = Flash Point

L = Latent Heat of Fusion, S = Specific Heat

Names	Formulae Emperical Structural	Mol. Wt.	Sp. Gr.	D = Diluent	B = Boiling Point	Vapour Pressure	Critical T = Temp. P = Pressure	Viscosity Centipoises	V = Latent Heat of Vaporization	Capillary Constant	Refractive Index	Surface Tension
o-Triphenyl Phosphate	$C_{18}H_{15}O_4P$ $PO(OC_6H_5)_3$	326$_{T}$		P	S 49.9^{T} B 320^{10}							40.63/65^{T}
Turpentine (commercial)	$C_{10}H_{16}$	136	0.865$^{32}_{15.5}$		F 33.3-34.4^{32}				S .42/18^{32} V 68.5/156^{T}		1.47^{32}	
Turpentine (commercial-wood)	$C_{10}H_{16}$	136	0.860-6$^{23}_{15.5}$	D	F 33.7^{23} B 150-8^{23}			1.34/25^{T}			1.465-9^{23}	
Urea	CH_4ON_2 H_2NCONH_2	60$_{T}$	1.335^{T}	P	S 132.7^{T}							
Vinyl Chloride	C_2H_3Cl CH_2CHCl	62$_{T}$		D	B -15^{T}							
o-Xylol	C_8H_{10} $C_6H_4(CH_3)_2$	106$_{T}$	0.879^{T} 0.8837$^{T}_{15.5}$	D	S -27.1^{T} F 29.^{T} B 144^{T}	10/20^{T}		0.95/12^{T}	S .411/30^{T} V 83.0/141^{T}		1.5058^{T} 1.50777$^{T}_{15.5}$	30.1/20^{T}
m-Xylol	C_8H_{10} $C_6H_4(CH_3)_2$	106$_{T}$	0.865^{T} 0.8686$^{T}_{14.85}$	D	S -53.6^{T} B 139^{T}	6.4/20^{T}		0.79/12^{T}	S .400/30^{T} V 81.3/138^{T}		1.4973^{T} 1.49962$^{T}_{14.85}$	28.9/20^{T}
p-Xylol	C_8H_{10} $C_6H_4(CH_3)_2$	106$_{T}$	0.861^{T} 0.8624$^{T}_{16.2}$	D	S +13.2^{T} B 137.7^{T}	16.4/20^{T}		0.80/12^{T}	L 39.2^{T} S .387/30^{T} V 81.0/137^{T}		1.4956^{T} 1.49734$^{T}_{16.2}$	28.37/20^{T}
Xylol (commercial)				D								

Collapsible Cellulose Tubes

A manufacturer of cellulose products is producing collapsible tube containers similar to those extensively used for tooth paste and similar products. Instead of employing tin or other metals the material used is either nitro-cellulose or cellulose acetate. These tubes are suitable for use with dry powder contents and can be used also with some paste substances so long as the latter does not attack the cellulose.

Compared with metal tubes, the cellulose type is better in appearance and keeps its good appearance as well as its shape during use. In addition, it can be had in a variety of colors, either transparent, translucent or opaque, and when collapsed to discharge its contents returns to its original shape. The cellulose tube can be handsomely printed if required. A variety of different caps can be applied. Some are slip caps of the same material as the tube itself; some, screw type, which may be either metal or plastic, others are made so that they turn to uncover an outlet in one position and cover it in another, but are not removable. The tubes are filled from the bottom, and then sealed with a metal clip which folds over the edges of the filling end.

Tubes of this type are made by the dipping process and are available in several sizes. By varying the size of the outlet, the contents can be made to discharge at almost any desired rate, and in the case of powders can be sprayed as may be desired with some dusting and insect powders. *From British Plastics.*

Solvent Retention in Polymerization Plastics

Some of the difficulties encountered during the manufacture of these comparatively new plastics are discussed by F. Ohl in the April issue of *Nitrocellulose*.

This branch undoubtedly presents many interesting possibilities chiefly in connection with polymerized derivatives of acrylic acid and vinyl acetate. Reaction products of polyvinyl acetate with drying oils have also been known for some time in the lacquer trade, while the vinyl acetate polymer itself is distinguished by good durability in lacquer finishes. Special problems arise, however, in attempting to exploit vinyl acetate for films and plastics, the main drawback being in connection with the extremely obstinate retention of solvent traces even in thin sheets of the finished product. This feature is perhaps most conspicuous in the acrylic type as exemplified by the author's figures for a 0.4 mm. thick sheet of methyl acrylate prepared by the standard method from a hot solution in ethyl acetate. The initial solvent content of 5 per cent. after high-temperature drying at atmospheric pressure could only be reduced to 3 per cent. after supplementary vacuum autoclave drying for 48 hours.

This unusually marked solvent retentivity is important because it reduces the mechanical strength to an extraordinary degree. With a residual solvent content of 2.55 per cent., for example, a methyl acrylate foil of 0.5 mm. thickness registered a breaking load of 3.6 kgs. per sq. mm., whereas after reducing the residual solvent to 0.30 per cent. the figure jumped to 4.9 kgs. per sq. mm. Roughly corresponding breaking loads for vinyl acetate film containing similar solvent traces were 4.44 and 5.065 kgs. per sq. mm.. In both cases the almost complete elimination of solvent—which might not be readily achieved under work conditions—brought about a notable improvement.

Resinification of Glycerine

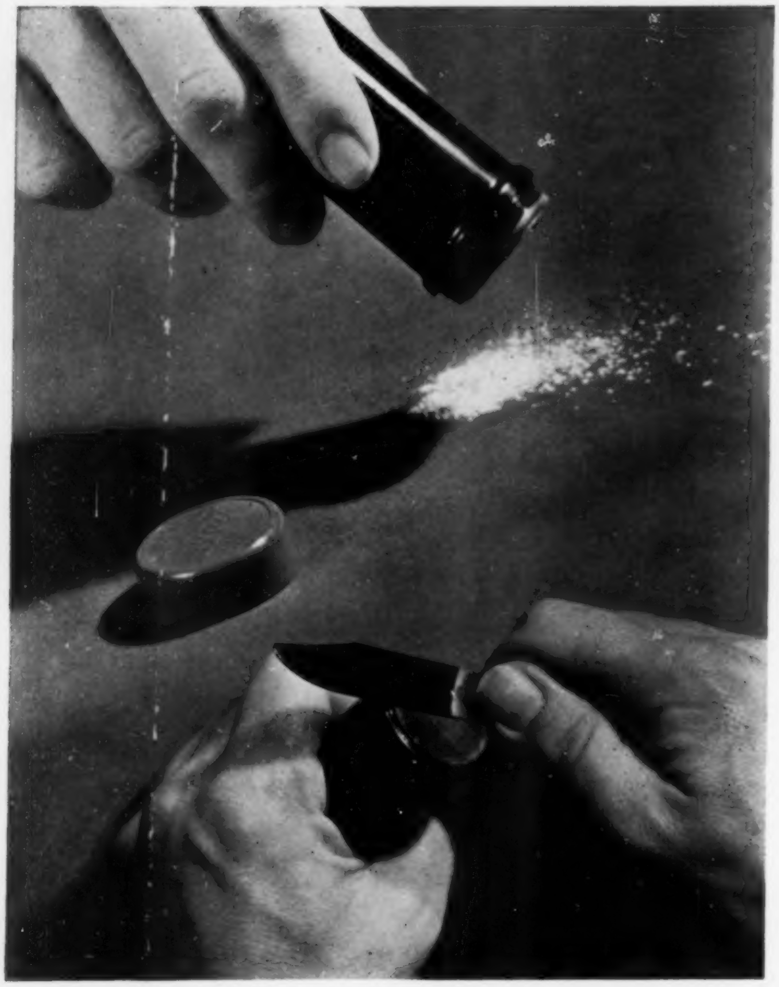
Most effective catalysts for direct polymerization of glycerine by heat are sulfuric acid, sulfurous acid, sulfates and sulfites, particularly mercurous and copper sulfates. Reflux glycerine for 14 hours in the presence of about 4% of the catalyst. The dark-colored synthetic resin, obtained in a yield of 60 to 68%, is viscous and soluble in water, alcohol, acetone, and a mixture of alcohol and benzol. If heated, it loses 10 to 15% of water, becomes infusible and forms elastic pellicles. By solution of the primary resin in water and drawing steam through the solution, a secondary resin remains, in yield of 31 to 50%, insoluble in water, corresponding to formula $(C_6H_7O_3)n$, apparently including two hydroxyl groups. This new secondary resin is proposed as an adjurant for phenolic resins particularly for coatings resistant to acids.—*Plasticheskie Massui.*

Plastics in Pictures

"Top-Flite" toiletries for men take on a new aspect with packages effectively protected with Bakelite Molded closures greatly enhancing their dignity. Anton Bruehl, in designing, used jet black jars for the hairdressing and talc, and a collapsible tube in the same color motif for the shaving cream.

If this contraption doesn't represent the acme of perfection to you, we don't know what will. The "Teleminder," produced in black Bakelite Molded matches the color and finish of the telephone receiver; and is fitted with a drawer which springs open at a light touch, bringing to view a memorandum pad. Device is fitted with a soft rubber base to prevent sliding on smooth desk tops and other surfaces.

A feature that sets the Smoke King cigar apart from competition is the Bakelite Molded tip which is supplied with every cigar. Tip is equipped with an absorbent filter, which makes for perfect cleanliness, a cooler smoke, and elimination of any harshness or bite that may be in the tobacco.



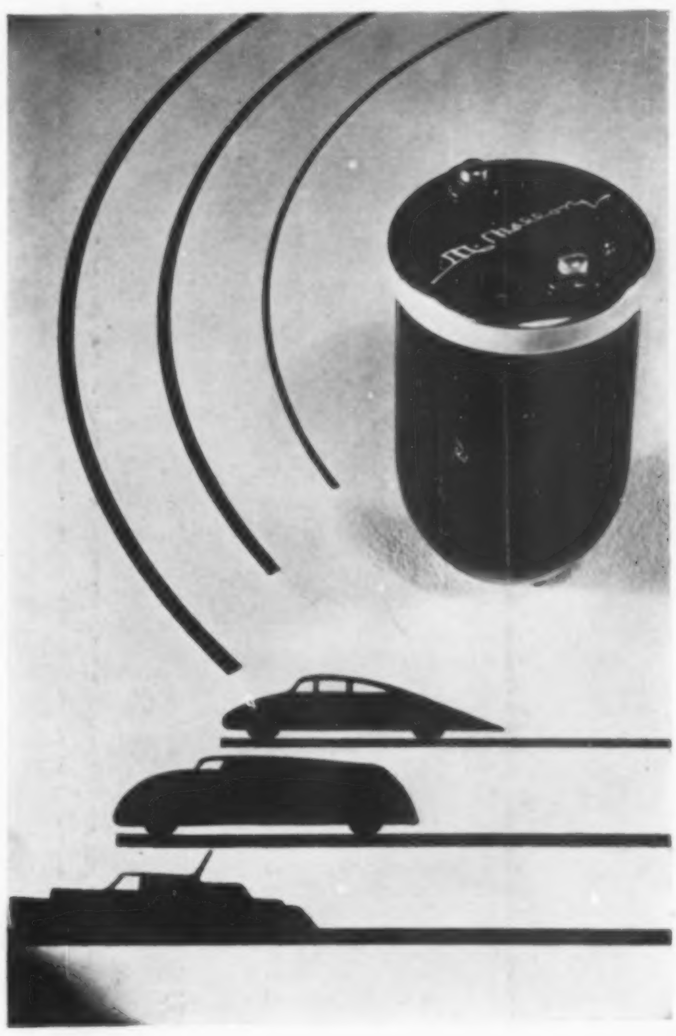
Several Bakelite Molded parts have been employed in the cons of low first cost, light weight and extreme durability. These because their smooth finish prevents injury to the product a covering.

Good news for campers! This cylindrical device for keeping salt dry can be carried in the pocket; has a removable shaker disc for refilling, and a molded screw-cap for a tight damp-proof seal. On the bottom is a round knife sharpening stone. Made by Havalite Products, and molded of red and black Durez.

A tasteless, odorless, and chemically inert molded beer scraper, unaffected by alcoholic beverages, and a truly necessary accessory for any bar.

loyed in the construction of this shoe processing equipment because urability. These parts are particularly adapted to this kind of work to the product and eliminates the need for a special padding or

Three current Bettleware premiums. The "Hot Dan" spoon which goes with French mustard. Hot Dan's foot hooks on the rim of the jar so the spoon won't get lost in the depths. The Beech-Nut coffee measure shows the user just how much coffee to use per cup, and the Scottie spoon is given with Grape-Nuts Flakes in three bright colors. Total used so far of these three is over seventeen million. The first two were molded by Diemolding Corporation, and the third by Diemolding and Richardson.



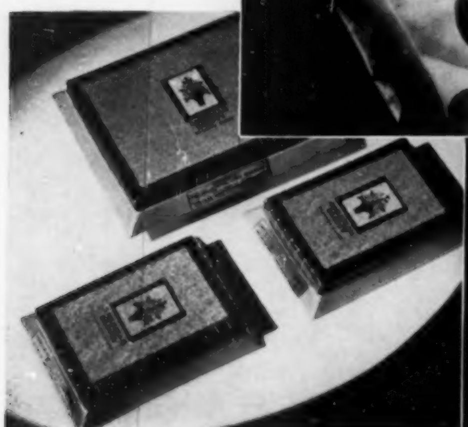
The only ignition coil that will run even with the secondary terminal and entire case submerged in water. Constructed by Mallory Electric Corporation so as to cushion the windings against shock and displacement. The special arc-resisting Durez used in molding the covers at both ends eliminates arcing breakdown and formation of carbonized paths. Entire case also molded of Durez to resist moisture and prevent high engine heats from damaging the interior windings.

Briarcraft, Inc., have introduced the "Turbulator," a novel feature in pipe construction which permits a dry, cool smoke. Produced in Transparent Cast Bakelite Resinoid in amber effect, enabling the user to see how the device contributes to smoking enjoyment.

Not a scratch in a lifetime! Heels covered with Pyraheel, a durable, scuffless material, are rapidly proving their metal in the shoe world, and more and more the feminine shopper is demanding shoes equipped with these heels, for they are entirely satisfactory in every respect. Shoes shown are from The Stetson Shoe Company.

Setting the style in table decoration with a lacquered fabric cloth, which holds no peril for the guests or hostess because it is waterproof and if something is accidentally spilled it can be cleaned immediately. Pattern shown here is called the "Eclipse" and is made of du Pont Lacquered Fabric. Design follows the vogue of dots and geometric patterns. Cloth from Gimbel Bros.

Single and double playing card sets with a center setting of Pyralin in gemmed effect. Boxes have a silver base with colored top and border of black with pin stripes which match the top in color. The Pyralin setting in the center shows a black basket with American beauty roses, which contrasts with the rectangular setting in rhinestone effect.



Handbags made of Fabrikoid are no longer news, but the white ones now so much in vogue are receiving wide recognition because of the fact that this material is of excellent appearance and can be washed with ordinary soap, thereby insuring spotless good looks for the bag every minute of its use. And are these bags being sold in large quantities! From the factory of Schoenfeld & Wolf.

Cumar in Plastics and Coatings

by J. A. Kenney

CUMAR has been available to the technologist and chemist for twenty years and because of its versatile properties has been adopted in a wide number of processes.*

Cumar is derived from coumarone and indene. These liquids together with attendant unreactive liquid hydrocarbons, occur in those coal tar naphthas having a boiling range of approximately 150-200° C.

The naphthas recovered at by-product coke ovens or obtained by tar distillation are subjected to rigidly controlled chemical treatment which, by polymerization, converts the reactive coumarone and indene to Cumar Resin.

By proper control of the treatment method many forms of Cumar are produced which vary from pale to dark color and in consistency from semi-fluids to resins of high melting point. The consumer has available to meet his special requirements a wide selection of types of resin; each a uniform product. The specification chart (Figure 1) shows the varieties of Cumar available commercially.

The Barrett Standard color designation is based on comparisons of the color of a given concentration of the resin dissolved in benzol with solutions having standard color values. The rosin scale to which these color designations correspond approximately is as follows:

Cumar Color	*Rosin Scale*
½	W.W.
1	W.G. to K.
2½	E.

For the melting point determination a one-half inch cube of the sample cast on the end of a thin metal rod is immersed in mercury. Heat is applied to the mercury to give a uniform temperature increase. The temperature at which the resin rises to the surface is multiplied by a simple factor to arrive at the air bath melting point of Cumar.

The wide range of properties covered by the various grades of Cumar makes possible their use in many industries. Such lines of manufacture as plastics, linoleum, rubber compounding, varnish, printing ink, mastic floor tile, adhesives, paint and varnish, dental products, waterproofing and leather finishing find Cumar a valuable raw material.

Some of the characteristics of Cumar which the technologists will find of interest when considering its use are:

Neutrality: Cumar is neutral, having an acid number of approximately 0.2. In products where low acidity is desired, such as printing inks, enamels or compounds where reaction with pigments must be avoided, Cumar is valuable.

Non-Saponifiability: Cumar is non-saponifiable. This makes it useful in coatings and compounds designed to resist alkalies and soaps.

Resistance to Water and Acids: The resistance of Cumar to water, brine and all but the strongest acids makes it valuable in compositions and finishes designed to withstand many corrosive agents.

Good Electrical Resistance: The electrical breakdown

FIGURE 1.
CUMAR SPECIFICATION CHART

Type	Grade	Color Designation Barrett Standard	Melting Range Barrett Method Deg. F.	Deg. D.	Ash (Less than)	Form
High Melting	W	½, 1, 1½	150-160	300-320	0.1%	Flake
Varnish	V	½, 1, 1½, 2, 2½, 3, 3½	127-142	260-288	0.1%	Flake
Rubber						
Special Soft	R 30	8	20-40	68-104	1.0%	Viscous
Rubber Soft	RS	8	40-58	104-136	1.0%	Solid
Rubber Hard	RH	4	77-95	170-203	1.0%	Solid
Medium						
Medium Soft	MS	8	58-77	136-170	1.0%	Solid
Medium Hard	MH	1, 2, 3½	105-127	220-260	0.5%	Flake
Plastic	P 10	1, 2½	5-15	40-59	0.1%	Viscous
	P 25	..	20-30	68-85	0.1%	Viscous
	P	..	30-95	86-203	0.1%	Viscous to solid
"X"	AX	10	20-30	68-85	1.0%	Viscous
	BX	10	35-45	95-113	1.0%	Viscous
	CX	10	45-55	113-131	1.0%	Solid
	DX	20	75-85	167-185	1.0%	Solid
	EX	20	100-115	212-240	1.0%	Solid
	FX	20	125-140	255-285	1.0%	Solid

* The trade-mark of The Barrett Company for its paracoumarone-indene resin products.

strength of Cumar is 1200 to 1400 volts per mil thickness. This desirable electrical strength coupled with its high dielectric constant makes Cumar a useful material for many forms of insulation and particularly for condenser insulation. Cumar maintains its electrical properties well, under conditions of high humidity.

Oxidation Resistance: Cumar has a low iodine value which is one reason for its resistance to oxidation. It behaves well in compositions exposed to moderate heat for long periods. Cumar has high flash and fire points.

Thermoplasticity: Cumar is strictly a thermoplastic resin and does not pass over to an insoluble infusible stage on heating. The hard grades of Cumar upon heating become soft at first and progress through stickiness to complete fluidity.

Miscellaneous Properties: Cumar is optically inactive. Its specific gravity ranges from 1.08 to 1.14.

Wide Compatability: The fact that Cumar lends itself to modification with a wide variety of other materials makes it possible, by blending, to develop compounds which retain many of the good qualities of Cumar and may be used where a resin alone would be unsuitable.

Cumar may be blended under suitable conditions with many materials of which the following substances are typical.

Waxes

Beeswax	Ceresin Wax	Japan Wax
Carnauba Wax (a)	Ozokerite	Montan Wax
Candelilla Wax	Chlorinated Naphthalene (Halowax)	Paraffin Wax (b)

(a) Many wax blends are best effected in relatively small amounts with rapid chilling.

(b) Blends of Cumar and Paraffin can be made in the proportion of 70 (or more) parts of Cumar with 30 (or less) parts of paraffin. To stabilize blends of Cumar with paraffin, agents such as Rosin, Beeswax or other mutual solvents may be used.

Resinous Bodies

Ester Gum	Oil Soluble Phenolic Resins	Vinyl Acetate Polymers (d)
Limed Rosin	Phthalic Glyceride Resins (c)	
Fused Congo Gum	Chlorinated Diphenyls (Arochlors)	
Lead Resinate	Chlorinated Rubber Resins (22) (23)	
Zinc Resinate		

(c) Highly modified drying oil or rosin base type phthalic glyceride resins blend with Cumar.

(d) Relatively small percentages can be blended with the lower vinyl acetate polymers.

Bituminous Materials

Pine Tar (Pitch)	Steam Reduced Asphalt (27)
Cottonseed Pitch	Blown Asphalts (27)
Stearine Pitch	Gilsonite and Other Natural Asphalts (27)
Coal Tar Pitch	

Rubber Industry Products

Polymerized Chloroprene Rubber	Rubber (28)	Sulphur (e) (29)
Gutta Percha (26)	Chicle	Hydrogenated Oils (12)

(e) Substantial amounts of sulfur can be dissolved in Cumar. Cumar is decomposed if heated to high temperatures with sulfur.

Mixtures of the following have been made with Cumar:

Degras	Stearic Acid	Tallow	Lanolin

The user has a wide selection of solvents upon which he may rely in working with Cumar. Cumar is soluble in a great many of the commonly used industrial solvents among which may be included:

Benzol	Carbon Bi-Sulphide	Ethyl Lactate
Toluol	Carbon Tetrachloride	Cyclohexanone
Xylol	Chloroform	Dibutyl Phthalate
Hi Flash Naphtha	Chlorinated Naphthalene	Tricresyl Phosphate
Coal Tar Oils	Diacetone Alcohol	Triphenyl Phosphate
Turpentine	Ethylene Trichloride	Ethyl and Butyl Cellosolve
Pine Oil	Ethyl Acetate	Dioxan
Terpineol	Butyl Acetate	Hydrogenated Abietates
Acetone	Amyl Acetate	

Cumar is insoluble in.

Methanol	Water	Glycerine
Ethyl Alcohol	Triethanolamine	Ethylene Glycol
		Methyl Cellosolve

Cumar is soluble to varying degrees in petroleum distillates depending on the grade of Cumar and the source and boiling point of the distillate used.

Behavior of Cumar with Oils

In effecting a blend with oils, Cumar is most generally melted with the hot oil. In some cases, however, satisfactory blends are obtained by powdering finely or grinding with the oil. Still a third way, obtaining chiefly in varnish practice, consists simply in addition of the oils to a solution of Cumar in a mutual solvent.

Cumar is easily soluble in the following refined oils:

China Wood Oil	Linseed Oil	Rapeseed Oil
Corn Oil	Menhaden Oil	Sardine Oil
Cottonseed Oil	Neatsfoot Oil	Soya Bean Oil

Cumar is insoluble in Castor Oil but it has been found that when Cumar is added to refined Castor Oil which has been rapidly heated above 500° F. a good blend is obtained.

Polymerized Oils: Cumar is also soluble in polymerized (Kettle bodied) drying oils and in combination with them is widely used in varnishes. Cumar is slightly less soluble in polymerized oils than in corresponding refined oils but degree of polymerization influences this solubility somewhat.

Blown Oils: Cumar is less soluble in blown oils than in the refined or polymerized oils although the degree of solubility depends on the nature of the oil and the extent to which it has been blown. Partially blown oils may be blended directly with Cumar, while heavy blown oils are satisfactorily blended by the addition of refined or polymerized oils.

Fatty Acids: Cumar is slightly soluble in Red Oil (Oleic Acid) and moderately soluble in the fatty acids of the drying oils.

Mastics and Molded Products

Cumar has received considerable attention in mastics and molded products for a number of reasons. The good electrical, brine and alkali resistance of Cumar together with its mobility and gloss imparting qualities in many compounding operations have made this resin an attractive material in this field. Cumar also permits a wide selection of colors due to its relatively low tinting power.

Cumar is generally employed in combination with modifying substances to improve its toughness and to aid in its incorporation with fillers. Conversely Cumar is used in lesser proportions with other molding resins where its properties may improve the compound.

Of considerable commercial importance and outstanding interest in the field of plastics is the mastic flooring industry.

Mastic Flooring

Early bituminous flooring compositions were made by preparing a workable plastic mass using a heavy solution of a suitable asphaltum as binder. The filler consisted largely of asbestos fibre with whiting, slate flour or silica together with pigmenting material. The plastic was applied with a trowel or similar implement and a 15 to 40 hour period was held necessary for the solvent to be expelled and for the floor to harden. As the demand grew for lighter colored flooring a considerable percentage of bitumen was replaced by Cumar. The Cumar was used because its low tinting power permitted the use of lighter colored pigments and it had the desirable qualities of alkali resistance and low oxidizability.

Floor Tile

Mastic floor tile has been prepared using certain selected asphalts as binders with asbestos, granular fillers and color.

An average of 30 per cent. binder has been used in the tile, being varied to allow for changes in the nature of binder and filler. The binder and filler are masticated on hot mixing rolls or in heated internal mixers of the Banbury type and subsequently sheeted while hot through sheeting rolls, polished and cut in squares. The quality of the tile depends not only on the raw materials but on the technique of compounding. Such tiles serve very well for many uses but because of the dark binder do not accommodate themselves to tinting in light or varied colors.

In order, therefore, to meet a growing demand for tile in light colors it was found necessary to develop a binder that had low coloring power. The qualities of low tinting power, alkali resistance, ease of compounding and the fact that it can be obtained in quantity conforming to a standard specification have designated Cumar as a particularly desirable raw material for mastic tile. Cumar is plasticized with various selected animal or vegetable pitches or specially processed oils so that a binder satisfactory in physical properties but light in color is obtained. The method of processing closely resembles that required for the production of ordinary mastic tile; in each case careful attention to manufacturing details is necessary to insure high quality of product.

It is interesting to consider the many United States patents involving Cumar which indicate the diverse fields in which the technologist has made use of this resin.

The value of Cumar in a base for linoleum cement compound has been investigated and it has been recommended for use in combination with jelled China Wood Oil or the solid oxidation product of linseed oil for this purpose (1).

Other type floorings have been prepared by saturating felted fibrous material with blends of Cumar with suitable plasticizers. The saturation has been undertaken with the blend in solution or in melted form (2). Similarly plasticized Cumar compounds combined with fibrous or granular fillers have been mounted on and combined with a felt or fibrous base (3).

The value of Cumar in the molding of commutator brushes and other molded electrical conducting carbons has been mentioned by McCoy (4). Subsequent baking, first at low and then at very high temperatures, serves to volatilize excess Cumar leaving a bonded conductor with its structure intact.

Preparation of molded electrical insulation materials from a pulp of asbestos or other fibrous material and a solution of Cumar with China Wood Oil in Benzol has been disclosed (5). Premolding, expulsion of solvents and final hot molding and baking treatments have been employed.

Incorporation of binder and filler without solvent by dry mixing or by mixing together under water to avoid lumping has been suggested (6).

To effect production of mold impregnated articles of Portland cement for insulators, etc., which could be rendered waterproof, it has been proposed to grind the cement and asbestos with Cumar. After hydrating, molding and allowing the article to set, gradual heating to cause the Cumar to flow and close the pores is suggested (7).

Other suggested means for impregnating porous articles of Portland cement and similar bodies was through absorption of Cumar in the interstices through immersion in the melted resin (8).

Power (9) has suggested similar treatment for filling abrasive wheel voids by the employment of a molten combination of Cumar and wax as a saturating medium to prevent loading of the wheel during operation.

To increase the plasticity and flow in molding of products from phenolic resins the use of Cumar alone or in combination with China Wood Oil has been proposed. (10) (11) Blends of hard Cumar and highly polymerized China wood oil have proved interesting as binders in highly compressed asbestos compositions.

It has been suggested that in such plastics as chewing gum Cumar can be advantageously employed in combination with chicle or in blends with rubber latex or hydrogenated oils. (12) (13) Cumar can also be used after plasticizing with purified mineral oils with refined alcohol soluble proteins (15).

The delaying effect of Cumar on the jelling of modified phthalic glyceride resins during condensation has been pointed out as a means for prolonging the reaction and effecting a more complete condensation (16).

To illustrate possibilities in the blending of Cumar to form interesting plastic bases the use of rubber dissolved in hard Cumar (17) or in blends of soft Cumar and Carnauba wax (18) may be mentioned.

Similar blends with rubber or with China Wood Oil that can be flowed under heat have been used as an alkali resistant sealing for anchoring brush bristles.

As a dielectric waterproof sealing agent the use of Cumar with sulphur and fillers has been found to be of interest (19).

It is claimed that mixtures of Cumar and Benzyl Cellulose with chalk give a sealing wax which is equal to any on a shellac base (20 (21).

Rubber Industry

Cumar has for many years been a standard compounding material in rubber manufacture. It has been used in a wide variety of rubber products, different grades being selected to meet specific requirements. Cumar functions chiefly as a softener and tack producer in compounding and in cements; to increase gloss in hard rubber and for many other purposes that cannot be covered in this article.

Many principles involved in the formulation of varnishes are applicable to a considerable degree in the preparation of plastics so that a review of the processing methods and handling of Cumar in this field seems to be in order.

Cumar in Paints, Varnishes and Specialties

The technologist can advantageously use Cumar as a resin in the formulation of such widely divergent coatings as ship bottom paints or for lining varnishes for food cans. Many of the interesting properties of Cumar have been described. When Cumar is properly applied in varnishes these valuable characteristics influence the nature of the finished product.

It is important to note that Cumar is finding a definite use as an auxiliary resin with some of the newly developed synthetic resins in the improvement of the quality of the finishes from these materials. Some interesting uses of Cumar may be mentioned to illustrate. Cumar acts as an effective holding agent in the cooking of China wood oil with oil soluble phenolic resins. Cumar also improves the adhesion of the finished coating prepared in this way. Its holding action has been employed in the preparation of certain alkyd resins (16) to which some of its alkali resistant qualities are imparted. Cumar has been employed to improve hardness of lacquers made from cellulose ethers (24) and also as a modifying resin in lacquers made from toluene soluble polymers of vinyl chloride (25). Cumar serves effectively as an alkali resistant modifying resin for chlorinated rubber resins (22) (23).

Some of the finishes in which Cumar is used are listed to illustrate the diversity of applications of the resin.

Paint and Varnish Industry

Alkali Resisting Varnishes	Heat Resisting Varnishes
Aluminum Paint Vehicles	Metal Primers
Baking Varnishes	Insulating Varnishes
Concrete Paint Vehicles	Tin Coating Varnishes

Printing Ink Industry

Carton Inks	Label Varnishes
Litho Varnishes	Over Print Varnishes
Intaglio or Rotogravure Inks	

Cumar Solutions: Cumar can be cold cut easily in coal-tar solvents or any other of the liquids listed as efficient solvents for this material. In making solutions of Cumar in petroleum naphthas it is better to reinforce such solutions with more efficient solvents.

Cooking Methods for Cumar in Varnishes

Cumar can be blended easily with prepared varnish oils by fusion or combining in a mutual solvent. It is the practice, however, to cook with China wood oil. Cooking principles are outlined herewith.

Advantages in Cooking: Because Cumar is easily handled at the usual cooking temperatures, it is a resin of great value to the varnish maker. Its ease of solution makes it an admirable material for cooling the batch after the top heat has been reached. Very little loss of resin is experienced under the usual cooking conditions. Cumar varnishes prepared under standard cooking conditions show little tendency toward progressive gelatinization upon standing and they blend easily with most of the common type varnishes.

Principles of Cooking

Short Oil Varnishes: In varnishes of 16 gallons (or less) of China wood oil to 100 pounds of Cumar, the oil can be heated rapidly to 400°F., at which point 80% of the Cumar is added. Following this the batch should be carried very speedily to the maximum temperature. Without allowing the oil to "string" the remaining Cumar should be added at once to check the batch, which may also be artificially cooled if necessary. The final bodying operation is conducted at 500°F. (or lower).

Long Oil Varnishes: A procedure similar to that described above for Short Oil Varnishes is often used, but to insure greater ease in handling gelatin retarding agents are generally added to the China wood oil. Such agents are:

a. Rosin or other Acid Gums
b. Resinates
c. Litharge or Red Lead
d. Lead Acetate or White Lead
e. Glycerine

In this procedure the holding agent is added to the oil which is heated rapidly to the maximum temperature. Cumar (sometimes with oils) is usually added as a chilling agent before the China wood oil "strings". Final bodying is conducted between 520°F. and 450°F.

Driers in Cumar Varnishes

Lead and Manganese Driers: Cumar is a neutral resin and reduces (by dilution) the acidity of the varnish in which it is used. Therefore, when it is necessary to use more than very small quantities of such driers as Litharge, Red Lead, White Lead, Lead Acetate, Manganese Oxide, Manganese Borate, etc., there should be some acidic material present to hold the driers in solution. This is generally supplied in the form of Rosin or Resinates. If such acidic agents are not used, part of the drier slowly precipitates as an insoluble soap. Upon standing, however, the powdery precipitate eventually settles, leaving a clear varnish. It is preferable to add Lead or Manganese Resinates, Linoleates, or Naphthenates instead of the above named compounds.

Cobalt Driers: Cobalt added as acetate is usually present in such small amounts that there is very little likelihood of its settling out. Cobalt Linoleate and Resinate are favored in Cumar Varnish, and either form of the metal may be added to the hot varnish, although soluble Cobalt driers, when added to the cold varnish, have worked equally well. Approximately .01% to .03% Cobalt (as metal), based on the weight of the oil, is used in all but the very short oil varnishes, in which case slightly more may be needed. The percentage is increased slightly when Linseed or Fish Oils in large quantities are used. Naphthenate drier solutions may also be employed in Cumar Varnishes.

The drying metals do not cause Cumar to precipitate from varnishes.

Characteristics of Cumar Varnishes

Varnish Liquid:
Low acidity.
Relatively unaffected by basic pigments.
Grinds well with pigments and fillers.*
Blends with many standard type varnishes.
Varnish Films:
Quick setting.
High gloss varnishes.
High gloss enamels.
Good dielectric.
Resist brine, acids and alkalies.
Excellent weather durability.

This discussion has dealt generally with Cumar in its relation to plastics and coatings. No attempt has been made to detail the great variety of applications to which the resin has been put. It is hoped that the references to the more important characteristics of the material and to the types of products in which it is used will be adequate to indicate to those interested in the possibilities latent in Cumar, a material which for several years has been notable as substantially the only chemically inert resin available at low price.

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* Asbestine, Carbon Black, Titanium Pigment, Zinc Oxide, Lithopone and Chrome Green.

(1) U. S. Patents 1,334,050; 1,381,737; 1,381,738.
(2) U. S. Patent 1,793,667.
(3) U. S. Patent 1,858,655.
(4) U. S. Patent 1,299,846.
(5) U. S. Patent Reissue 15,199 of U. S. Patent 1,300,217.
(6) U. S. Patent 1,299,706.
(7) U. S. Patent 1,299,798.
(8) U. S. Patent 1,299,847.
(9) U. S. Patent 1,310,292.
(10) U. S. Patent 1,425,784.
(11) U. S. Patent 1,038,745.
(12) U.S.P. 1,930,436.
(13) U.S.P. 1,534,929.
(15) U.S.P. 1,887,930.
(16) U.S.P. 1,915,544.
(17) U.S.P. 1,682,397.
(18) U.S.P. 1,913,244.
(19) U.S.P. 1,612,576.
(20) Plasticheskie Massui 1932 No. 2-4; 29-34.
(21) British Patent 838,603.
(22) U.S.P. 1,572,065.
(23) U.S.P. 1,541,693.
(24) British Patent 383,603.
(25) British Patent 379,292.
(26) U.S.P. 1,236,190.
(27) U.S.P. 1,849,867.
(28) U.S.P. 1,682,397.
(29) U.S.P. 1,782,693.

This Month's Cover

The attractive item displayed on our cover is the Globar-Electric Match, molded of heat-resisting, permanently shiny Durez. It requires no refilling and has no wearing parts to require replacement. Patented resistor bar protruding from the end glows when the button is pressed, lighting the pipe, cigar or cigarette.

Plastics and Coating News

Brown Sells Certain Timber Rights—Textolite Display Easels—Tornesit Prices Reduced—Catalin Sues Catalazuli—Tenn. Eastman Appoints

Brown Corp. of Montreal (an affiliate of Brown Co.) has sold certain timber rights for $750,000. About $500,000 will be used to pay off Canadian bank loans. Anglo-Canadian Pulp & Paper (a Lord Rothermere interest) has acquired exclusive rights to make and market within the British Empire (except Canada) the paper and pulp products of the Brown Co. which are based on the patented "Solka" (cellulose) product.

Filberloid reports $153,803 net profit for year ended Dec. 31, '33, against a loss of $79,664 in '32.

A New Name

Directors of the Manufacturers' "Merchandise Advertising" Association, in session on June 20 at the headquarters of the Association at 580 5 ave., N. Y. City, unanimously decided to change the name to National Premium Advertising Association. New name was decided upon when the directors became convinced it would more truly represent the membership and purposes of the Association. Certainly new name is much more easily understood.

Easels of Textolite

Designed to lend added visual appeal to point-of-sale display, a new line of Textolite easels, available in five models and three finishes, has been introduced by the General Electric Plastics Dept. New product will be marketed through display and fixture jobbers.

Four of the models are intended for the display of various shapes and sizes of merchandise—such as women's purses, silverware, china, shoes, jewelry, books, candy boxes, etc. Fifth model is to be used as a standard for show cards, posters, and similar displays. In its weighted base is a slot, adjustable by means of a concealed spring, into which various thicknesses of signboard can be readily inserted. All models are obtainable in any one of 3 finishes—black, walnut, or mahogany. They are modernistic in design, with a smartness of effect desirable in attaining distinction of trim.

Textolite, a molded plastics product, is not affected by heat, cold, or other atmospheric conditions. It does not "sweat," tarnish silverware or other metal displays, or mark leathers, silks,

New aid in selling appeal brought out by G. E.

etc. Easels are conveniently washable in ordinary soap and water, and with reasonable care will retain their rich, lustrous finish for years—thus minimizing replacements.

New plant of the Catalin Corp. of Canada, Ltd., (owned and controlled by parent company, Catalin Corp. of America) adds a new industry to our northern neighbor. Operations, it is understood, will start in 2 or 3 months

Coatings

"Tornesit" Lowered

Substantial price reductions on "Tornesit," new chlorinated rubber protective coating base, have been announced by Hercules, sponsors of the product. Hercules officials state that the reduction in price has been made effective at once because of the encouraging acceptance of the new product. Although Tornesit is now imported from Germany, Hercules is contemplating the construction of a new plant in this country. Tornesit is not only especially effective in resisting alkalies and acids, but shows much promise as a general protective coating, Hercules officials report.

Foreign

Rapid development in the utilization of artificial horn and synthetic resins in Czechoslovakia was strikingly shown by the numerous wares exhibited at the Spring Sample Fair held in Prague from March 11 to 18, inclusive.

Progress in the casein plastics industry has been due to the influence of the artificial horn cartel. In the cartel the Czechoslovak company "Argo" is joined with the Austrian company "Ajkalit," the German company "Lactonit" and the English company "Laconit" and the English company "Erinoid."

Prices of the raw material were increased by 15% on Jan. 1, '34, due to the increased cost of casein, and may be again advanced as a result of the devaluation of the Czechoslovak crown.

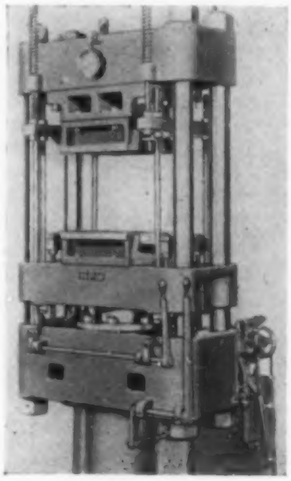
Equally notable has been the utilization of artificial resin, which is rapidly supplanting glass in the manufacture of certain types of beads, artificial jewelry, ornaments and other so-called "Gablonz" goods. Principal Czechoslovak manufacturer is the "Grelit" company of Nixdorf, Bohemia, operating under patent of the German I. G. Following devaluation of the Czechoslovak crown, domestic prices of artificial resin were increased by 10%.

Synthetic Resin Course

Chemical Engineering Dept., University of Southern California, announces 2 courses for fall and spring terms respectively on "Rubber Technology" and "Synthetic Resins." These will each consist of 12 evening lectures and discussions and will be given by R. B. Stringfield, Dental Plastics Co. Mr. Stringfield has been active in the field of rubber and plastics for many years and was formerly chief chemist of the Goodyear Tire and Rubber Co. of California.

Equipment

Hydraulic Press Mfg., Mount Gilead, Ohio, has recently developed a new line of molding presses with individual electric motor drive, through



A new press with several important developments

the patented H-P-M "Dual-Speed" hydro-power transmission. Each press is compactly self-contained with press cylinder and control valve equipment enclosed within a pedestal, which also contains the supply of operating oil.

However, outstanding features of the H-P-M Molding Press of most vital importance to the molder is the unusually complete H-P-M System of Controls. These not only provide adjustable automatic pressure control, but also regulation of speed of ram movements and an entirely new patented control principle, especially developed by H-P-M for plastic molding, whereby the rate of pressure increase is automatically governed according to pre-determined adjustment. The latter H-P-M control principle introduces a new concept in the application of pressures to the molding art, superseding the "stair-step" method of changing pressures.

K. & J. Appoint

Kuhn & Jacob Molding & Tool has appointed H. A. Ledig as representative in Philadelphia, Eastern Pennsylvania, Maryland and Delaware, with offices at 1712—67 Ave., Philadelphia. Telephone, Hancock 0972.

Molded

Plaskon, made by Toledo Synthetic Products, is used for the Platinum

May Paint, Varnish and Lacquer Sales

Sales of paint, varnish and lacquer products in May totaled $33,678,877 in value, against $27,768,932 in April and $26,241,044 in May last year, according to the monthly report of the Bureau of Census based upon data received from 586 establishments. May sales topped any month since the end of 1931. Sales for the January-May period were $123,000,311, against $81,875,529 in the corresponding period last year. Details of May sales, including industrial and trade classifications, and a comparison with preceding months this year as well as comparative data for the months of 1932 and 1933, follow:—

		Classified sales reported by 344 establishments				Unclassified
	Total sales reported by 586 establishments	Industrial sales			Trade sales of paint, varnish and lacquer	sales reported by 242 establishments
1934		Total	Paint and varnish	Lacquer		
January	$20,643,659	$6,015,030	$4,290,923	$1,724,107	$7,470,517	$7,158,112
February	17,715,447	5,639,413	3,714,128	1,925,285	6,256,162	5,819,872
March	23,193,396	7,105,176	4,768,864	2,336,312	8,504,997	7,583,223
April	27,768,932	7,589,828	5,256,548	2,333,280	10,845,963	9,333,141
May	33,678,877	8,091,723	5,824,403	2,267,320	14,079,824	11,507,330
1933						
January	11,275,396	3,529,886	2,386,947	1,142,939	4,168,260	3,577,250
February	11,665,734	3,423,033	2,445,378	977,655	4,771,706	3,470,995
March	13,578,568	3,391,947	2,484,550	907,397	5,788,213	4,398,408
April	19,043,787	4,677,309	3,143,803	1,533,506	8,582,411	5,784,067
May	26,241,044	5,991,938	4,298,455	1,693,483	11,788,573	8,460,533
June	27,813,233	6,827,509	4,832,551	1,994,958	12,443,998	8,541,726
July	22,090,187	6,406,184	4,493,516	1,912,668	8,627,400	7,056,603
August	20,620,811	6,323,475	4,754,701	1,568,774	7,840,359	6,456,977
September	19,097,803	5,544,686	3,975,917	1,568,769	7,462,113	6,091,004
October	18,944,106	4,949,755	3,721,420	1,228,335	7,376,012	6,618,339
November	16,234,234	4,656,353	3,466,174	1,190,179	6,566,157	5,011,724
December	16,156,062	4,418,023	3,428,376	989,647	6,157,567	5,580,472
Totals, year	$222,760,965	$60,140,098	$42,431,788	$16,708,310	$91,572,769	$71,048,098
1932						
January	$15,894,506	Comparable statistics not available.				
February	16,270,822					
March	19,089,005					
April	22,612,193					
May	24,981,441					
June	19,637,358	$4,685,399	$3,617,719	$1,067,680	$8,734,330	$6,217,629
July	14,430,122	3,793,245	2,900,707	892,538	6,058,813	4,578,064
August	16,032,441	3,851,028	3,057,096	793,932	6,918,659	5,262,754
September	16,805,712	3,980,564	3,113,303	867,261	7,216,748	5,608,400
October	15,592,377	3,996,500	3,036,323	960,177	6,610,011	4,985,866
November	12,492,818	3,599,319	2,639,362	959,957	5,196,766	3,696,733
December	9,484,520	3,222,770	2,186,706	1,036,064	3,506,715	2,755,035
Totals, year	$203,323,315	....	....	....	....	....

Products Co.'s new Glolite flameless cigarette lighter introduced last month.

Tenn. Eastman Appoints

William L. Searles is now representing Tennessee Eastman in their sale of "Tenite" in the East. Mr. Searles has been associated with Tennessee Eastman at Kingsport for several years. Friends of Robert L. Churchill will be pleased to learn of his advancement to the position of assistant to the general superintendent at Kingsport. Mr. Churchill previously sold "Tenite" in the territory which Mr. Searles is now assuming.

Childs Speaks

Richard S. Childs, Beetleware, spoke before the N. Y. City Charter Commission recently.

The '34 quota of electrical refrigerators has been set by the Electrical Refrigeration Bureau at 1,010,056.

Bookshelf

Rayon and Synthetic Yarn Handbook, by Dr. E. W. K. Schwarz and Herbert R. Mauersberger, 420 p., published by Rayon Publishing Co., 303 5th ave., N. Y. City. $3.00, domestic; $4.00 foreign, plus postage.

Perfectly enormous expansion in the synthetic yarn industry in the past few years has created urgent need for a handy reference book on the technical and statistical side of the American rayon industry. This 1st attempt admirably fills this need.

Colour Science, by Wilhelm Ostwald; Part 1, 141 p.; Part 2, 173 p.; published by Winsor & Newton, 31 E. 17th st., N. Y. City.

Colour Science has been translated from the German by J. Scott Taylor. Part 1 deals with color theory and color standardization; Part 2 deals with the multitudinous applications of the science of color. The 2 books constitute an authoritative (the late Wilhelm Ostwald was one of the outstanding scientists, particularly on the subject of color) handbook for advanced students in schools, colleges, and the various arts, crafts, and industries depending upon the use of color.

British Plastics Federation has taken larger quarters at Room 207, Textile Exchange Bldg., 1-3 St. Paul's Churchyard, London, E.C. 4.

Cast

Catalin has filed suit against Catalazuli Manufacturing, also Erich Heidenbluth, alleging infringement of certain patents involving the manufacture of cast synthetic resins. Catalazuli is located at College Point, N. Y. City. Patents in questions are the same ones on which Marblette Corp. and Joanite Co. have recently taken out licenses.

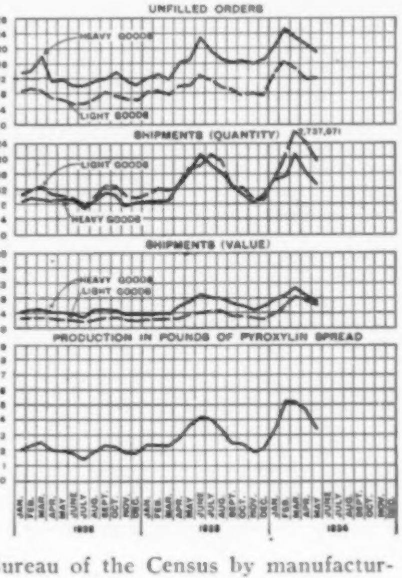
Improved Earnings

Catalin Corp. of American reports for 6 months ended June 30, 1934, profit of $162,382 after depreciation, charges, etc., but before federal taxes, comparing with profit of $35,014 in like period of 1933.

Cellulose

Following table presents monthly statistics relating to pyroxylin-coated textiles based on data reported to the

PYROXYLIN-COATED TEXTILES
MAY, 1934
COMPARED WITH PRECEDING MONTHS



Bureau of the Census by manufacturers comprising most of the industry. The data include products manufactured by spreading nitro-cellulose or pyroxylin preparations, either by themselves or in combination with other materials, upon grey goods, such as sheetings, drills, ducks, sateens, moleskins, etc.

Item	1934 May	1934 April
NUMBER OF MFRS. REPORTING	20	20
LIGHT GOODS:		
Shipments—		
Linear yards.......	1,994,776	2,418,297
Value	$604,614	$770,308
Unfilled orders (a)—		
Linear yards.......	1,228,819	1,194,904
HEAVY GOODS:		
Shipments—		
Linear yards.......	1,332,131	1,605,057
Value	$700.599	$868,930
Unfilled orders (a)—		
Linear yards.......	1,910,255	2,150,958
PYROXYLIN SPREAD (b):		
Pounds	3,349,731	4,681,078
MONTHLY CAPACITY (c):		
Linear yards	12,822,689	12,822,689

(a) Orders on hand at the close of the current month (reported in yards only) exclusive of contracts with shipping dates unspecified.

(b) Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8-lb. jelly.

(c) Based on a maximum quantity of 1.27 to 1.30 sateen, coated to a finished weight of 17½ ounces per linear yard, in a 24-hour working day, 26 days to a month.

Litigation

"Cellophane" is a trade-mark and belongs to the Du Pont Cellophane Co., Inc. So said the U. S. Court for the Eastern District of N. Y. in the suit of this company against Waxed Products Co. An injunction was issued against the latter company substituting any similar product when "cellophane" was specified, unless the facts were clearly told the customer.

CELLULOSE PLASTIC PRODUCTS

(Nitro-cellulose and Cellulose-acetate Sheets, Rods, and Tubes)
May, 1934

Compared with preceding months

The Bureau of the Census presents, in the following table, monthly statistics on production and shipments of cellulose plastic products (sheets, rods, and tubes) for May, 1934, based on data furnished by 10 identical manufacturers. Statistics are also shown for 8 identical manufacturers from January to July, and for 10 identical manufacturers from August to December, inclusive, 1933. Segregated data for nitro-cellulose and cellulose-acetate products are not available prior to January, 1933.

Production and Shipments (Pounds)

	Nitro-Cellulose						Cellulose-Acetate	
	Sheets		Rods		Tubes		Sheets, Rods, and Tubes	
Year and Month	Production	Shipments	Production	Shipments	Production	Shipments	Production	Shipments
1934								
January ...	734,085	701,581	138,590	160,081	75,106	67,853	357,836	377,346
February ..	916,646	849,552	159,936	133,585	75,315	62,473	435,690	418,027
March	1,194,455	1,012,224	162,202	177,263	78,299	62,270	405,280	350,526
April	1,133,085	871,462	167,787	155,842	82,882	58,171	510,225	558,360
May	725,906	825,262	169,168	174,818	78,249	68,953	511,851	555,725
Total (5 months)	4,704,177	4,260,081	797,683	801,589	389,851	319,720	2,220,882	2,259,984
1933								
January ...	504,813	625,392	74,872	115,424	12,812	29,329	167,856	160,272
February ..	490,290	593,942	78,904	100,092	16,248	25,711	141,628	125,073
March	454,506	611,840	63,188	87,784	17,472	32,525	119,400	117,344
April	473,333	624,727	104,817	130,853	26,198	27,091	149,402	211,435
May	787,614	774,424	161,784	126,195	32,684	36,992	234,811	221,345
Total (5 months)	2,710,556	3,230,325	483,565	560,358	105,414	151,648	813,097	835,469
June	912,742	959,194	156,830	139,772	41,467	45,057	242,013	220,686
July	1,027,812	916,612	158,250	160,851	42,100	41,467	192,381	221,751
August	1,290,521	1,257,981	254,249	236,730	40,364	56,142	230,013	231,879
September .	1,307,052	1,158,080	241,558	232,725	49,263	58,962	213,996	229,629
October ...	1,056,328	991,557	254,375	216,191	76,291	69,258	207,327	217,892
November .	641,059	827,544	189,668	134,750	78,712	63,967	257,872	278,774
December .	562,152	944,821	163,317	183,471	72,428	92,673	325,412	352,362
Total (Year) ...	9,508,222	10,286,114	1,901,812	1,864,848	506,039	579,174	2,482,111	2,588,442

Plastic Patents

Abrasives

Union of abrasive layer to cellulosic material, hydrolyzing. No. 1,954,655. H. R. Stratford, to Strathmore Co., Cleveland, O.

Cellulose

Process for plasticized cellulose derivatives. No. 1,953,-956. Henry Dreyfus, London, England.

Cellulose acetate covering for rubber cement coated article. No. 1,954,219. H. E. Moyses, New York, N. Y.

Pulping of manila, sisal or like fibrous materials. No. 1,954,226. G. A. Richter, to Brown Co., Berlin, N. H.

Method of preparing cell. acetate films. No. 1,954,312. E. S. Farrow & S. J. Carroll, to Eastman Kodak Co., Rochester.

Filament process using cellulose ether & tetrachlorethane. No. 1,954,324. Leon Lilienfeld, Vienna.

Cellulose composition containing acetate, cyclo-hexanone & ortho-cresyl para-toluene sulfonate. No. 1,954,326. T. F. Murray & C. J. Staud, to Eastman Kodak Co., Rochester, N. Y.

Cellulose derivative solvent. No. 1,954,336. C. J. Staud & C. S. Webber, to Eastman Kodak Co., Rochester, N. Y.

Water insoluble cell. acetate phthalate, in superficial coating. No 1,954,337. C. J. Staud, to Eastman Kodak Co., Rochester.

Improving products from cell. esters & ethers by aliphatic alcoholic amine. No. 1,954,729. C. Dreyfus & Geo. Schneider, to Celanese Corp.

Unlaminated board from defiberized wood, felted. No. 1,955,411. Wm. A. Darrah, Chicago.

Strand material, interfelted mercerized cell. fibers. No. 1,955,567. M. O. Schur & B. G. Hoos, to Brown Co., Berlin, N. H.

Evaporation of solvent in spinning solution. No. 1,955,-793. H. Dreyfus & W. I. Taylor, England, to Celanese Corp., Del.

Cellulose-wool fibers, rubber impregnated, as artificial leather. No. 1,955,892. M. O. Schur, to Brown Co., Berlin, N. H.

Coherent, dry-laid web, rubber coagulated, artificial leather. No. 1,956,179. M. O. Schur, to Brown Co., Berlin, N. H.

Cellulose adhesive in metal shell cap. No. 1,956,481. A. H. Warth, to Crown Cork & Seal, Balto.

Plastic sheeting of increased mobility and tensile strength. No. 1,956,564. P. W. Crane & R. T. Fields, to Du Pont Viscoloid Co., Wilmington, Del.

Sulfur dioxide in mfr. of cellulose esters. No. 1,956,832. D. B. Mason, to U. S. Ind. Alc. Co., N. Y.

For reducing vicosity of nitrocellulose. No. 1,957,180. M. G. Milliken, to Hercules Powder, Wilmington, Del.

Trade-mark for lacquers, resins, etc., used in solid liquid or paste form. No. 311,213. Carb. & Carbon Chem. Corp., N. Y.

Trade mark renewal from 1914. Coal-tar distillates without oils, gums or colors as preservative coating. No. 96,858. Barrett Mfg. Co., N. Y.

Shellac-metal radical compound. No. 1,953,951. W. A. Boughton, to N. E. Mica Co., Waltham, Mass.

Cellulose

Trade mark, "Sorbtex," for preparation to increase the absorbency of cellulose products. No. 348,586. Ralph L. Dombrower Co. Inc., Richmond, Va.

Insulating composition for aircraft, organic derivatives of cellulose. No. 1,961,208. Camille Dreyfus, New York.

Low viscosity cellulose acetate, No. 1,961,251. V. B. Sease, to du Pont & Co., Wilmington, Del.

Shrinking treatment for regenerated cellulose. No. 1,961,-268. J. Voss, Ger., to du Pont Cellophane Co., New York.

Process for foils and sheets of cellulose from aqueous solutions. No. 1,961,316. R. Weingand, Bomlitz, Germany.

Trade mark, for cellulose acetate composition. No. 313,-800. H. Goodman & Sons, Inc., New York.

Trade mark, for cellulose fabrics, etc. No. 313,872. Celanese Corp., New York.

Nitrocellulose and metal salt composition to prevent film from ultra-violet deterioration. No. 1,962,132. Hamilton Bradshaw, to du Pont & Co., Wilmington, Del.

Butyric acid solvent for cellulose derivatives. No. 1,-962,157. G. W. Seymour, to Celanese Corp., New York.

Process of stabilizing cellulose nitrate. No. 1,962,327. M. J. Reid, to Eastman Kodak Co., Rochester, N. Y.

Cellulose moisture-proof material. No. 1,962,338. W. H. Church, to du Pont Cellophane Co., Inc., New York.

Fibrous cellulose nitro-acetate soluble in acetone. No. 1,-962,345. H. LeB. Gray, to Eastman Kodak Co., Rochester, N. Y.

Film base for color fotografy, with synthetic resin separating layer. No. 1,962,679. Baker, Bonamico and Grist, to Dufaycolor L'td., London.

Colored cellulose composition, ester, resin and phthalide. No. 1,962,774. A. O. Jaeger, to Selden Co., Pittsburgh, Pa.

Water-insoluble cellulose derivative containing fosforus. No. 1,962,828. C. J. Malm & C. E. Waring, to Eastman Kodak Co., Rochester, N. Y.

Cellophane sheeting material, with binding members. No. 1,962,190. G. E. Ginn, Des Moines, Ia.

Article from cellulose organic esters. No. 1,963,251. G. Schneider, to Celanese Corp., New York.

In process for film from substitution derivatives of cellulose. No. 1,963,765. J. H. Stevens & J. F. Walsh, to Celluloid Corp., Newark, N. J.

For recovery of chemical compounds from sulfate cellulose process. No. 1,963,862. O. Nordstrom, Sundsvall, Sweden.

Cellulose stearate-non drying oil lubricant. No. 1,963,901. K.C.D. Hickman, to Eastman Kodak Co., Rochester, N. Y.

Trade mark, "Pyra-shee," for plastic cellulose derivative. No. 350,543. Shoe Form Co., Auburn, N. Y.

Mfr. of useful products from cellulosic materials. No. 1,-963,972. Henry Dreyfus, London, England.

Insoluble soaps for cellulose acetate materials. No. 1,-963,974. G. H. Ellis, to Celanese Corp., New York.

Colloiding nitrocellulose for propellant powder. No. 1,-963,992. G. C. Hale, Dover, N. J.

Cellulose nitrates from Musa fiber. No. 1,964,017. E. C. Worden, Wyoming, N. J., to Hanson & Orth, New York.

Transforming cellulosic materials into conversion products. No. 1,964,646. Oxley, Groombridge and Challis, Engl., to Celanese Corp., New York.

Trade mark, Pyroxylin coated fabric. No. 314,534 du Pont & Co., Wilmington, Del.

Trade mark, cellulose caps & bands for container closures. No. 314,666. Sylvania Indus. Corp., New York.

Trade mark renewed, solvents for cellulose esters, resins etc. No. 97,667. Badische Anilin & Soda F., to Chemical Foundation, New York.

Pulverized cellulose, stable white powder, at least 93% alpha. No. 1,964,772. M. O. Schur, to Brown Co., Berlin, N. H.

Cellulose ester, gum, plasticizer & solvent composition yielding a film. No. 1,965,453. E. H. Bucy, to Atlas Powder Co., No. Chicago, Ill.

Action on Patent No. 1,406,148. Bands of cellulosic material du Pont Cellophane Co., vs. Hy-Sil Mfg. Co.

Mfr of nitrocellulose. No. 1,965,577. P. B. Cochran, to du Pont & Co., Wilmington, Del.

Reclamation of mixed organic esters. No. 1,966,302. C. J. Malm & W. E. Fisher, to Eastman Kodak Co., Rochester, N. Y.

Organic ester, using aryl-substituted malonic acid. No. 1,966,317. H. B. Smith, to Eastman Kodak Co., Rochester, N. Y.

Coloring of organic cellulose ester plastics. No. 1,966,-327. R. O. Wood, to Eastman Kodak Co., Rochester, N. Y.

Coatings

Stable, pigmented solution, cellulose derivative, for varnishes, lacquers, etc. No. 1,961,229. J. Ladrette, France, to du Pont Rayon Co., N. Y.

Coating composition, nitrocellulose & abietic acid ester. No. 1,961,931. I. W. Humphrey, to Hercules Powder Co., Wilmington, Del.

Cellulose nitrate coating & solvent therefor. No. 1, 962,-151. M. H. Morrison & E. H. Nollau, to du Pont & Co., Wilmington, Del.

Coating composition. No. 1,963,142. W. H. Moss & G. W. Seymour, to Celanese Corp., N. Y.

Rapidly drying coatings from phenol-aldehyde resins. No. 1,963,973. E. Elbel & F. Seiter, to Bakelite Gess., Berlin, Ger.

Tough lacquer body & adhesive, for decal transfer paper. No. 1,965,289. F. W. Humphner, to Mid-States Gummed Paper Co., Chicago.

Trade mark, for chemicals to waterproof natural & artificial leathers. No. 314,766. Rohm & Haas Co., Inc., Phila., Pa.

Trade mark, lacquers & varnishes. No. 314,814. E. Dorken A. G., Germany.

Cellulose ester lacquer on Thermoprene rubber compound as architectural lacquer system. No. 1,965,627. C. Bogin, to Comm'l Solvents, Terre Haute, Indiana.

Laminated

Gelatin-cellulose ester plastic safety glass. Nos. 1,963,-601-2. G. B. Watkins, to Libbey-Owens-Ford Glass Co., Toledo, Ohio.

Laminated glass, No. 1,963,798. W. L. Monro, Pittsburgh, Pa.

Trade mark, "Dilecto," for synthetic resinous laminated sheets, rods and tubes. No. 330,783. Cont'l-Diamond Fibre Co., Newark, Del.

Machinery

Rotatable winder & cutter for cellophane. No. 1,963,644. W. B. Bronander, Montclair, N. J.

Method and apparatus for rolling & shaping plastic materials. No. 1,965,603. M. Low, to H. N. Low, Washington, D. C.

Apparatus & method for cutting laminated glass. No. 1,-966,353. E. W. McConnell, Jr., to Amer. Window Glass Co., Jeanette, Pa.

Miscellaneous

Soluble condensation product of carbohydrate, phthalic anhydride, anaromatic hydrocarbon, sulfuric acid & formaldehyde. No. 1,961,151, A. O. Jaeger, to The Selden Co., Pittsburgh.

As a plastic product, certain vegetable material with phenol and a mineral acid agent. No. 1,961,588. L. R. Jones, Petersburg, Va.

Felted cellulose pulp with powdered binder as water-laid sheet. No. 1,961,945. M. O. Schur & W. L. Hearn, to Brown Co., Berlin, N. H.

As electrical insulator and capable of fabrication, porous material filled with sulfur & chlorodiphenyls in impervious form. No. 1,962,003. M. Darrin, to F. N. Burt Co., Lt'd., Toronto, Ont.

Trade mark, electric insulating compound in powder, sheet & molded forms. No. 313,808. S'te des Accum. Elec. Alfred Dinin, Nanterre, Fr.

Olefin-polysulfide plastic. Reissue. No. 19,207. J. C. Patrick, Trenton, N. J.

Method of producing molded compositions from asbestos. No. 1,962,577. D. Wolochow, Ottawa, Ont.

Coated metal panel, to be earthed, using synthetic resin binder. No. 1,962,584. D. N. Davies, London, Eng.

Paste of polymerized vinyl esters. No. 1,962,930. W. O. Herrman & W. Haehnel, to Consortium fur Elek. Ind., Munich, Ger.

Trade mark registration, plasticizers. No. 314,163. Pennsylvania Lubricating Co., now Penola Inc., Pittsburgh.

Trade mark registration renewed, artificial horn from casein, 1914. No. 95,629. Int. Galalith-Gess. Hoff & Co., Harburg, Ger.

Trade mark registration renewed, shellac varnish, 1914. No. 100,081. Berry Bros. Detroit, Mich.

Trade mark registration renewed, celluloid-covered eyelets and lacings for shoes, 1914. No. 100,400. Peerless Mach'y Co., Boston.

Polymer of a vinylethinyl carbinol. No. 1,963,074. Carothers, Berchet & Jacobson, to du Pont & Co., Wilmington, Del.

Method of producing plastic expanded vermiculite. No. 1,963,276. C. S. Miner & R. Ericson, to Nat'l. Vermiculite Prod. Corp., Chicago.

For the recovery of phenols from gas liquors. No. 1,-963,516. W. B. Wingert, to Semet-Solvay Eng. Corp., New York.

Vinylethinyl derivatives & process. No. 1,963,934. W. H. Carothers & R. A. Jacobson, to du Pont & Co., Wilmington, Del.

Vinylethinyl derivatives & process. No. 1,963,935. W. H. Carothers & G. J. Berchet, to du Pont & Co., Wilmington, Del.

Disclaimer from No. 1,779,367. H. A. Bruson. Resinous Prod. & Chem Co., Phila., Pa., assignee.

Trade mark granted. Insulating molding compounds. No. 314,370. S'te of Chem. Ind. in Basle, Basel, Sw. Also No. 314,373 to the same.

Design for ash tray. No. 92,626. F. G. Purinton, to Patent Button Co., Waterbury, Conn.

Sulfide plastic, aldehydes with alkaline polysulfides. No. 1,964,725. Carleton Ellis, to Ellis-Foster Co., Montclair N. J.

Process for carbon black No. 1,964,744. W. W. Odell, Chicago.

Plastic of vulcanized rubber distillate, fatty acid & an alkali. No. 1,964,848. T. J. Fairley to W. J. and M. P. Hunter, Shreveport, La.

For mfre of shellac bonded abrasive material. No. 1,-965,016. D. E. Webster, to Norton Co., Worcester, Mass.

Disclaimer from No. 1,783,165. Mixed esters of colophony. H. A. Bruson and Resinous Products & Chem. Co., Assignee.

Trade mark grant, for thermoplastic or themo-setting plastic-molding compositions. No. 314,831. Erinoid, Limited, London, England.

Binder, solvent, filler & impregnating agents for cold-molded article. No. 1,966,094. C. A. Herbst, to Economy Fuse & M'fg. Co., Chicago.

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